Depo David Townsend, 2-11-00
Time is 2:20.

EXAMINATION BY MR. BROWN

Q. Dr. Townsend, please state your full name for the record.
A. My name is David Eugene Townsend.
Q. And you are employed by the R.J. Reynolds Tobacco Corporation, correct?
A. That's right.
Q. And you have been with them for about 21 years, maybe a little more?
A. It's little over 22 years.
Q. Okay. And when you first went with them, what year would that be?
A. 1977.
Q. And when you first went in there, were you given a title?
A. I came in as -- my first assignment was as senior R&D chemist.
Q. Let me ask you to just take me from title to title right up till now. We'll go back and talk about what they mean later. Senior research.
A. Senior R&D chemist?
Q. R&D?
A. Uh-huh.

Q. Okay. Next?
A. What do you mean, the next level?
Q. Yeah. Well, next title. Maybe you didn't -- maybe your job didn't change, just got a better title.
A. All right, I think the next title after that was R&D program manager, which was actually still a scientific position in the research and development department.
Q. Program manager?
A. Right.
Q. Okay. What year was that?
A. I can give you approximate year. I think that was about 1980 or '81.
Q. Okay.
A. I can certainly give you accurate dates if you really like.
Q. No, that's close enough. What's next?
A. The next title was master scientist.
Q. Okay.
A. The next --
Q. What year was that?
A. In 1983.
Q. Okay. Next?
A. Principal scientist.
Q. And that was what year in?
A. I believe '87.

Q. Okay.
A. Then I was promoted to senior principal scientist. I believe that was 1996. And then from there I was promoted to director of product development. The next level was vice president.
Q. I'm sorry, when was director?
A. '97.
Q. All right.
A. Vice president of product development and assessment.

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Q. Is that your title now?
A. No.
Q. Vice president of product --
A. Product development and assessment. That was in '98. And then '99, vice president of product development and process development.
Q. Product development and --
A. And process development.
Q. And process?
A. Uh-huh.
(Whereupon, Exhibit 1 marked.)
BY MR. BROWN: Q. Okay. When you first came with the company, who was the senior employee at RJR. Can we call it RJR; is that okay, R.J. Reynolds?
A. RJR is what I call it.

Q. Okay. Who was the senior employee, officer in terms of science?
A. When I first came with Reynolds, there were actually two departments. There was a research department and a development department; they were separate.
Q. Okay. Who had which department?
A. The research department was led by Dr. Laurene at the time.
Q. How do you spell Laurene?
A. L-A-U-R-E-N-E, I believe.
Q. That's a --
A. Actually, I'm sorry, let me try to think back through this. Dr. Laurene, I believe, was in charge of both research and development at that time, 1977. Reporting to him was, I believe, Murray Senkus.
Q. Okay.
A. For the research department.
Q. Research and development is the name of the department. That's what you call it?
A. There was actually two departments. There was a research department and a development department, and I believe Dr. Laurene was in charge of both.
Q. Let me ask, before I ask you to repeat it, did you bring some kind of table of organization that indicates --
A. No.

Q. Did you know you were requested to?
A. No.
Q. Okay. Well, we'll get into all that later.
Now there were two departments, research and development was one?
A. No.
Q. Okay, let me start over because I think I got confused here.
A. Right.
Q. How was science broken down and who was in charge of that?
A. The scientific work at Reynolds was in two departments. There was a research department and there was a development department.
Q. All right.
A. They each had their own head, and as I recall, I believe both of those departments reported to Dr. Laurene.
Q. What was his title?
A. I don't really remember.
Q. Okay. And research was who?
A. I believe that was Dr. Senkus at the time.

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Q. S-E-N --
A. S-E-N-K-U-S.
Q. And the development?
A. I'm trying to remember who that was in '77. I

don't recall.
Q. Okay. Now did the way it broke down change over time?
A. Well, it did because in the early '80s, I would say '81 or thereabouts, research, the research department and the development department were merged into one, so then it became one department responsible for both research and development.
Q. Which department did you start in?
A. I started in the research department.
Q. Okay. And was there any significant changes in the, what I'm calling the table of organization science-wise since then?
A. Not really. We continued to do the same types of research, the same types of scientific investigations. The only real difference was that there was better interaction between the research end of it and the development end of it.
Q. Okay. Now let me go back and pick up something that normally you start a deposition with. Your education involves multiple degrees, as I read some of your background. Do you want to just briefly tell us what those degrees are and when you got them?
A. Sure. I have a B.S. degree in chemistry from University of North Carolina.
Q. Okay.

A. In 1969.
Q. All right, and --
A. I have a master's, M.S. degree in chemistry from Florida State University 1972, and I have a Ph.D. degree in chemistry from Florida State University, 1974.
Q. The thesis in chemistry Ph.D. was what?
A. It was in organic mechanistic photochemistry.
Q. Did it have anything to do with your work at RJR?
A. Not directly. It dealt with mechanisms of photoreactions, that is, reactions of molecules with light.
Q. You graduated, or you got your Ph.D. in 1974 and you started at RJR in 1977. What did you do in the meantime?
A. Worked for a chemical company. The name of that company was Rohm & Haas.
Q. R-H-O-M-E?
A. R-O-H-M and Haas, H-A-A-S.
Q. What did you do for them?
A. I was a research chemist in the research and development department.
Q. How did you come to go with RJR?
A. You mean what caused me to take a job with --
Q. The circumstances, how did it all come together?
A. I had small children at the time, and my wife and I particularly wanted to move to certain areas of the country, so I went out and tried to see what was available in various

areas of the country that we particularly wanted to live in, took a job with R.J. Reynolds.
Q. Are they in Winston-Salem?
A. Yes.
Q. And what did you do at Rohm & Haas as research chemist, what products were you looking at, if any?

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A. I was doing research processes for acrylates and methylcrylates.
Q. Which is what?
A. Acrylates and methylcrylates are precursors to plastics, certain types of plastics. For example, methylcrylates are precursors to plexiglass. A lot of functional acrylates are precursors for auto finishes and paints, acrylic paints and that sort of thing.
Q. I would suppose that all chemistry jobs probably have some relationship to each other, but any direct relationship between what you were doing for Rohm & Haas and what you have been doing for RJR?
A. What do you mean, direct relationship?
Q. Well, I mean doing exactly the same kind of testing, dealing with the same kind of government regulations, you know, something like that.
A. Well, in that sense, no, there is not a direct relationship.
Q. They're both chemistry jobs, but other than that,

there's no particular relationship?
A. The way you outline that, I'd say there's no direct relationship between what I did for Rohm & Haas and what I've done for R.J. Reynolds.
Q. Okay. And were you with Rohm & Haas the entire roughly what, three years?
A. Yes.
Q. All right, let me go to Exhibit No. 1, which I'll give you the marked copy of and ask you to turn to Exhibit A, which contains the list of documents which were requested for this deposition.
MR. BROWN: And I get the understanding here that nothing has been produced. Would I be far off on that one?
MR. LATHAM: That's not correct.
MR. BROWN: That's not correct? Well, okay then.
MR. LATHAM: As you know, Bob, Mr. Brown, we filed --
MR. BROWN: Bob is okay.
MR. LATHAM: That's okay, keep it formal, I guess. We notified you that we objected to Exhibit A as an improper request for production. In addition to, that we have agreed to provide a set of documents that we've brought with us today that are Dr. Townsend's potential demonstrative exhibits, CV, documents he's reviewed for the case, and we identified all of his reliance documents which you requested

in your deposition notice, and that's been provided previously.
MR. BROWN: Demonstrative docs, the CV and the reliance documents?
MR. LATHAM: And everything he's reviewed for this case.
MR. 1234: Reliance and review documents.
MR. LATHAM: There you go. That is what we have with us today or have otherwise identified to you.
MR. BROWN: Okay. Could I -- maybe we can get that marked and I can take a glance at them as we're doing this.
MR. LATHAM: Do you want to mark all of them?
MR. 1234: Probably.
MR. LATHAM: Okay.
MR. BROWN: Okay, No. 1 will be the CV. I'm showing you that. That's what it is?
MR. LATHAM: You mean No. 3.

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MR. BROWN: I'm sorry, it will be No. 3.
(Whereupon, Exhibit 3 marked.)
MR. BROWN: Now we have some color, a whole bunch of stuff here that's in color. Some are clipped together and some aren't. Any significance to that?
Q. Let me ask you, Dr. Townsend?
A. Any significance to what?
Q. These are separate, these two, and then these are

10

all clipped together, does that have any significance?
A. I'm not aware of any significance.
Q. All right. Any particular order in which you are going to present these?
A. I'm sure there is.
Q. Okay, could you show me what they have?
A. Well, if you really want to take the time. I mean we can flip through them and I'll give you some general sense of the order. It depends on whether you want to spend your time that way.
Q. Okay, let's -- maybe you are right. Maybe I'll just take a look at what they are.
Okay, let's just go to the next number, whatever it is. Whatever it is, it's entitled "R.J. Reynolds Tobacco Company Offers Smokers A Range of Tar Levels" and it shows 1955 to 1986. And then the next one, which would be 5, is charcoal filters failing in the marketplace.
MR. LATHAM: Off the record.
(Whereupon, discussion held off the record.)
BY MR. BROWN: Q. All right, the next one is one that is entitled "The Modern Cigarette"; then the next one is entitled "Puffing"; the next one is entitled "Composition of Cigarette Mainstream Smoke." The next is "Identification of Smoke Constituents Increased Through Advances In Technology." The next, "Techniques explored to reduce BaP." Is that

11

benzoid?
A. That refers to benz-a-pyrene.
Q. Okay. The next one is Table 26, Reduction of Biological Activity of Cigarette Smoke." That's from '79 Surgeon General's Report page 14-114. I think wondered about that at the time. That doesn't mean it runs from page 14 to 114; that's some kind of a combination page number?
A. Let me see. We can certainly go back to the Surgeon General's Report. I think, yeah, this -- as I recall, there's actually a large section of discussion about exactly what's summarized in this chart and there's also the same information or similar information to this in chart form in the Surgeon General's Report throughout these pages, so --
Q. The chart -- those are pages, pages 14 through page 114?
MR. LATHAM: To avoid any confusion, that is the page number. The page number is 14-114.
MR. BROWN: Okay. What is 14, a chapter or something?
MR. LATHAM: It must be.
BY MR. BROWN: Q. We don't know?
A. I don't remember.
Q. Okay. Next one is "Significant Problems With Selective Reduction"; the next is "Advantages of General Reduction"; next is "General Reduction Techniques."

12

A. This may make the deposition go faster. "Method of Filtration." "Filter Modifications" is the next one.

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"Reconstituted Tobacco" is next.
Q. Next is a chart that is entitled "Air Dilution." Next, the chart says "Winston '85: Major Design modifications 1954-1986, Tar Yields and Nicotine Yields."?
Let me just ask about that one. This demonstrates by year and the type of modification what the tar yield on and nicotine yield became. Is that the idea?
A. The point of this chart is that there are several, there are a number of technologies that have been implemented in Winston cigarettes over the years, and this tries to represent the corresponding tar and nicotine levels, or yields from those, from Winston cigarettes at those points in time.
Q. Okay. All right, next is "Reduction of BaP-Nanograms Per Cigarette." Maybe I can handle this chart without coming back to it; just ask you a quick question. When you say nanograms per cigarette, what are you talking about there?
A. That's the yield of that particular constituent from the cigarette on a per cigarette basis. Nanogram, of course, is a billionth of a gram.
Q. My question really goes to "per cigarette." Are you talking about all of the smoke that comes out of the

13

cigarette during its entire smoking period or are you talking about something else?
A. I'm talking about in the mainstream smoke, that's smoke that issues from the mouth into the cigarette.
Q. And throughout the smoking of the entire cigarette?
A. Throughout the smoking of the entire cigarette under FTC smoking conditions.
Q. Okay. So 9 nanograms per cigarette as of the 1999 Camel Lights 100, I guess is that what that chart shows?
A. That is correct.
Q. That would be the, what you have detected in some kind of testing is the benz-a-pyrene entire content in all of that smoke for the entire smoking of that cigarette?
MR. LATHAM: Object to the form of question, misstates his testimony.
THE WITNESS: What the chart indicates is that 9 nanograms of benz-a-pyrene is delivered in the mainstream smoke. That's smoke that issues from the mouth into the cigarette while smoking that cigarette under FTC smoking conditions.
BY MR. BROWN: Q. That doesn't mean by any means under the FTC approach that all smoke that comes through there?
A. It's per cigarette yield, as I think I have made it clear.

14

Q. Well, I wanted to make it even beyond clear; I wanted to be very certain I understand. You are not talking about one inhaling, that whole puff, but that whole cigarette?
A. We're talking about per cigarette yield once again.
Q. Okay, okay. Next, "Camel 70: Major Design Modifications - 1954-1986, Tar Yields and Nicotine Yields." It has a chart that's somewhat like the other one, the other chart, what had to do with another brand, another one of your RJR brands.
A. I believe it was Winston.
Q. Okay. This time we're talking about Camel, okay. Now we have "Sales-Weighted Average 'Tar' Yields and Nicotine

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Yields 1954-1993." Explain to us what sales-weighted average means.
A. What that chart represents is the sales-weighted average tar yield from cigarettes, commercial cigarettes in the marketplace as a function of time; that is, average yield for all cigarettes in the market. So half of the cigarettes in the market have yields higher than that; half of the cigarettes are lower than that on a sales-weighted basis.
Q. And what is the sales-weighted average? What are you talking about there? Explain that.
A. Well, that's what I thought I was explaining. If you look at the market share of every brand in the market and

15

multiply that times the tar yield, then you can calculate a sales-weighted tar average for the entire market.
Q. Okay, that may explain it to me. How do you calculate it again? Tell me what you do.
A. If you take for each brand style that's present in the market the share of market for that brand style and then look at the tar yield from that brand style, multiply the two together, you get a weighted tar yield based on that share of market, and then you sum across all brand styles in the market. Then you calculate a sales-weighted tar yield for the market, which is a snapshot of the average tar yield corrected for share of market, or corrected -- yeah, corrected for share of market.
Q. On the right side of the chart it has "nicotine yield." Is that the green line?
A. The lower line is the nicotine yield and the legend for that is on the right-hand side of the chart.
Q. Well, let's just take the Camel Lights 100. Take me through how you would determine what the sales-weighted average of the tar yields was for Camel Light 100.
A. Okay. For that particular brand style, Camel Lights 100, one would take the tar yield of it --
Q. What is that?
A. Say about 11 milligrams per cigarette.
Q. All right.

16

A. And then one would determine the market share of that product.
Q. Okay.
A. And then --
Q. This is your best estimate of what?
A. That is the market share of Camel Light 100. I don't know off --
Q. And I take it that would be per year, whatever the chart is?
A. The whole chart is -- I mean the chart represents the sales-weighted average as a function of year.
Q. Right. So you'd -- I'm sorry.
A. No, please let me finish.
Camel Lights 100 is just one of several hundred brands sometimes, so you take its share of the market and use that to calculate a corrected tar, or not a corrected tar but you multiply the tar and the share of market together, so you get a contribution to the total from Camel Lights 100. So if it were 11 milligrams per cigarette for Camel Lights 100, and the share of the market if it were, say, 0.5 percent of the market, then one would take those two numbers, calculate a contribution to the total, do the same for all the other brand styles available in the market so that the total market share comes up to 100 percent, and then sum those, the

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products of the two to get a sales-weighted average. This is not as complicated as it sounds. What the sales-weighted tar or nicotine numbers represent is the average tar yield for cigarettes bought in the market.

17

Q. The question I was asking is whether you calculate the market year by year or do you take some kind of average over the whole period of time?
A. Oh, no, calculate it year by year.
Q. Okay. So any spot on this chart that shows nicotine yield, that's the average sales-weighted average of all those brands, each one of them calculated separately for that year?
A. For that year, that is right.
Q. Okay. And if I understood what you described to me on the Camel Light, you would multiple milligrams times a share of 0.5?
A. If that were the share of market. Again, I don't know what that is exactly.
Q. Is that about what it is today?
A. I don't recall.
Q. And you'd get a number, and then you'd get the same number for every single year, you'd add that together and then you'd do the same for all other brands?
A. No, you get that number for every single brand style, you sum across every brand style available in the market, and you get a number for that year.

18

Q. And then you just go on to the next year and do the same thing, keep doing it?
A. Sure.
Q. Okay. Next one just says "Premiere." How would you use that in your presentation?
A. Are you talking about in court?
Q. Yeah.
A. In court I intend to show a pack of Premiere cigarettes; that's a xerox copy of it.
Q. Okay. Then next chart shows Premiere and it shows a diagram cross-section of the Premiere cigarette. And then the next chart says "'Tar' Comparison, Premiere vs. Tobacco-Burning Cigarettes." In each of the boxes underneath -- well, what I guess represents a cigarette, would that be right?
A. No, the box is just a label for each of those filter pads that's actually photographed there.
Q. It says TPM. What does that mean?
A. Total particulate material.
Q. And other than the Premiere, which is identified, is there a particular non-filtered cigarette that you have up here or is it some kind of average or what?
A. May I see it? Yeah, the non-filtered cigarette in the upper left-hand corner is identified as such, unfiltered cigarette with the 40 milligram TPM yield.

19

Q. What cigarette is it?
A. The particular cigarette? I don't remember. This is, this is actually taken from the Premiere nanogram.
Q. Okay, if I could have it back?
A. Uh-huh.
Q. Are they RJR cigarettes?
A. I can't say that all of them are RJR cigarettes. I suspect -- well, I don't know; I wouldn't guess.
Q. Okay. Just incidentally, this information come

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from the Ames testing that was done in what, was it in '95-'96?
A. This has nothing to with Ames testing. This is just a visual inspection of filter pads taken after collection of tar, that's all.
Q. Okay, okay. The next is a diagram or cross-section of the "Eclipse Cigarette" followed by a picture of the Eclipse box. Then we have one entitled "Smoke pH and Market Share of Winston 85" clipped to one that's entitled "Smoke pH of Winston 85," without the market share, I guess. Okay. That's from '72 through 1988. All right. "Smoke pH and Market Share of Camel 85," and the same second sheet, which is just "Smoke pH of Camel 85." Then we have one that's entitled "Premiere Specific Mainstream Constituent Analysis" followed by "Comparison of 1R4F Total Particulate Matter" and it also says "Composition of Premiere Total Particulate

Matter." The 1R4F cigarette is the reference cigarette?
A. 1R4F is a reference cigarette.
Q. Okay. By "constituent," are you talking about just additives or are you talking about compounds that are created after the additives are burning, or what are you talking about?
A. By referencing to constituent, I'm talking about those compounds that are present in the TPM, meaning the total particulate material.
Q. All right. So that would include everything in that cigarette regardless of how it got there, including through combustion or however?
A. It talks about what is in the smoke itself.
Q. Right. While we have this one out on the Premiere, which if any of these compounds are carcinogenic?
A. Well, there's a number of these that are listed on the IARC list as being carcinogens or possible or probable carcinogens. Do you want me to go down the list and pick out some of them?
Q. Pick out all of them.
A. I'll do my best to pick out the ones: benzene, benzopyrene, NNN, NNK, NAT, NAB. Some of these are, I think, thought to be possible carcinogens; we'd have to go back to the IARC list and look at them, like toluene.
Q. Do this for me. I'll give you a pen --

A. All right.
Q. If you would just put a checkmark on those which you are telling me have been listed as carcinogenic by someone. You can tell me --
A. In any category on the IARC list?
Q. Yes.
A. Okay. Understanding that we can actually do this accurately by comparing directly to the IARC list, but --
Q. Put it on the left of the margin.
A. All right.
Q. There you go.
A. These represent probably different levels in the IARC list, right, do you understand that?
Q. That's right.
A. There's one I'm not sure about, so I won't mark it. Okay.
Q. Okay, let's see. And this is for, this is for the 1R4F and for the Premier. What year are we talking about here?
A. Those data were generated in the late '80s.

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Q. Let me get the spelling of where these come from, the list you are referring to.
A. I-A-R-C.
Q. It stands for?
A. International Agency for Research on Cancer.

22

Q. It's your opinion that these are all carcinogenic?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I don't know. We're talking about what's on the IARC list.
BY MR. BROWN: Q. I'm asking you, do you have an opinion whether any of these are carcinogenic?
A. Well, I think under particular concentrations of of them may be. Certainly benzene is clearly, I believe, thought by most people to be carcinogenic.
Q. Any others?
A. Benzene is on the 1A IARC list, so it is thought by most people to be carcinogenic.
Q. Okay, but I'm asking about you.
A. I'm trying to answer your question, okay? Some of the others, like the tobacco-specific nitrosamines fall in the 2A or 2B list, so there's less certainty whether or not those are carcinogenic. They may be.
Q. Okay. Now you have told me what other people think. What do you think? Which ones of these, if any, in your opinion is carcinogenic?
A. I believe -- and this is really not my area of expertise.
Q. I understand.
A. Based on what I have seen and read, I believe benzene is carcinogenic.

23

Q. Would that be the only one?
A. Let me have the list again.
Q. Sure.
A. That's the only compound I see here, or constituent I see here that I recall being on the Class 1 list that IARC puts out, so that would be the only one I would say yes, I believe for sure.
Q. Does that suggest that you only reach the opinion that something is carcinogenic that's on Class 1 list of the IARC?
A. How much do you know about the IARC list? There's extensive --
Q. I'm asking your opinion.
A. There's extensive testing, there's extensive data calculation, evaluation, interpretation, quite a lot of judgment goes into the development of that list. That doesn't mean it's a perfect list or that it's necessarily accurate, but certainly for chemists looking IARC list, it's a first place to start. I would give more consideration, more concern about compounds that are on the 1A list -- I'm sorry, on the IARC 1A list than I would those that are on the 2B list, but again, I'm not an expert in this area.
Q. Well, if I understand your testimony, as far as your own personal opinion is concerned, benzene is the one compound on there which you in your opinion consider

24

carcinogenic?
MR. LATHAM: Object to the form of the question.
THE WITNESS: Understand that I'm not an expert in this area. I'm a chemist, not a biologist.
If one looks at the IARC list, benzene is on the

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Class 1 list.
BY MR. BROWN: Q. But the answer to my question is yes or no?
A. If I look at --
Q. Read the question back, if you want.
A. If I look, if I look at the list, I see benzene is on the Class 1 list.
Q. Okay.
A. I would have more reason to conclude that it's, that it's a likely carcinogen than the rest.
Q. You are still not answering my question.
A. Okay, then read the question back to me.
Q. Okay, go ahead.
(Whereupon, question read.)
MR. LATHAM: Object to the form of the question.
BY MR. BROWN: Q. That's a yes, no, I don't know.
MR. LATHAM: Same objection.
BY MR. BROWN: Q. With any explanation you want.
A. I'm a chemist; I'm not a biologist. If I look at the available information, it seems to me that benzene

probably is a carcinogen at some levels of exposure.
Q. Can you say that, give me that same answer with respect to any other compound on this list?
A. That's more difficult to do because, as I recall, benzene is on the Class 1 list. I'm not a biologist; it's hard for me to interpret beyond that.
Q. To your knowledge, has anyone at RJR, any group of people at RJR determined what the carcinogenic compounds are within your cigarettes?
A. We've done extensive chemistry, I think we've done a lot of toxicology and biology on smoke. We look to the IARC list, the Surgeon General's list as experts in the field to help us understand the biology of, of a variety of constituents in smoke.
Q. Okay, now I know what you do. Now I'd like you to answer my question.
A. Okay, and your question was? Sorry.
MR. BROWN: Read it back.
(Whereupon, record read.)
MR. LATHAM: Object, asked and answered.
THE WITNESS: We've identified and quantitated a number of compounds in cigarette smoke that are present on the IARC or Surgeon General's list.
BY MR. BROWN: Q. Okay. Now I know what you have identified. Now I'm asking the same question again, so I'll

just have her read it back to you. If you listen, you will understand I'm asking a little different question than you are giving me an answer to.
MR. LATHAM: Object to the commentary. The question has been asked and answered twice.
(Whereupon, record read.)
THE WITNESS: Well, I think I've answered that because I think I have made it clear that we've identified compounds that are on that list in smoke and we've quantitated the levels, and in fact some of those that are on that list that you have in front of you.
BY MR. BROWN: Q. Is there some reason that I'm missing why you can't give me a yes or a no on that?
A. You asked me a question, if we've studied or/and determined what in smoke are carcinogenic, and I'm telling you that we have studied it in great detail, we've identified

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a number of compounds that are thought to be carcinogenic, and we've quantitated those things, and in fact, you are holding it in your hand.
Q. What does the R.J. Corporation consider to be carcinogenic after whatever study you have done in your cigarettes?
A. Look, I'm a chemist, I'm not a biologist. I can tell you that we look very closely to the IARC, to the Surgeon General and to the conclusions that are made about

27

the various constituents. We're experts in the constituents that are present in smoke. If you need to go beyond that, then you need to talk to somebody that knows more in that area.
Q. The question is not aimed at your opinion. What I asked you was whether RJR has identified for their own satisfaction what they believe is carcinogenic in their brands of cigarettes. That's what I'm asking. Can you answer that question?
A. And I'm telling you very clear and specific there we've identified a number of compounds in cigarette smoke and we've quantitated the levels of a variety of constituents that are found on the IARC list and on the Surgeon General's list.
MR. BROWN: Would you read the question back again?
(Whereupon, record read.)
MR. LATHAM: Object to form of the question; it's been asked and answered.
THE WITNESS: And it wasn't my opinion. I'm telling you what R.J. Reynolds has done. We've identified and quantitated the constituents, a large number of constituents that are present on the IARC list, on the Surgeon General's list, and are thought by the scientific community to be carcinogenic.
BY MR. BROWN: Q. And are you -- RJR accepts that

28

list?
A. I think the -- well, you will have to talk to somebody that's more knowledgeable than I about biology and toxicology. I think we certainly look to that list for guidance. I think it -- you know, you will just have to talk to somebody that knows more about it than I do.
Q. Does RJR act in the design and the formulation of the contents of their cigarettes by depending upon and relying upon the carcinogens which you have just referred to, those which are listed on IARC plus Surgeon General plus others?
A. I'm not sure I understand your question. Can you ask that again?
Q. Sure. Does RJR act in reliance on this list of carcinogens which are obtained from various people, including IARC and the Surgeon General and so forth?
A. What do you mean, act in reliance? I don't understand that.
Q. Do you treat your cigarette design, do you treat what you do with your cigarettes, do you treat what you try to do to make cigarettes safer by relying on what the carcinogens are identified by those various agencies?
MR. LATHAM: Object to the form of the question, vague, confusing, overbroad.
THE WITNESS: I'm still not sure that I understand

29

your question. Let me see if I can help you out, though. If

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you are asking do we look to the IARC list, the Surgeon General's list in helping guide our research and development on cigarette design, the answer is yes.

BY MR. BROWN: Q. Okay. Well, I think you have answered it apparently as best you can. Let me ask you this about this document I'm looking at. That's the one that says "Premier - Specific Mainstream Constituent Analysis." That's not a list of every compound that is found in an RJR brand of cigarette, is it?

A. No.

Q. All right, tell me what RJR brand -- withdraw that. With respect to the Camel Lights 100, what are the compounds which have been identified as carcinogenic?

A. Let me back up and make sure this is clear. The chart that you are holding in your hand compares a tobacco-heating cigarette, which is Premier, and a tobacco-burning control or reference cigarette, which is 1R4F.

Q. Okay.

A. Okay. If you go and look at any tobacco-burning cigarette, we know a lot about the constituents that are present in the smoke. So for all tobacco-burning cigarettes at different tar levels, including the lights level, we have very good information about a variety of constituents that

30

are present

Q. All right. My question is with reference to the Camel Light 100, please identify for us all of the compounds which RJR has identified as being carcinogenic.

A. Okay. For example, Light 100s specifically?

Q. Yes.

A. For Camel Lights 100 specifically, I don't know as we sit here the extent of chemical analysis of the smoke that's been conducted. We'd have to look.

Q. You don't know as you sit here? You don't know?

A. That's what I just said.

Q. How many are there?

A. I beg your pardon?

Q. How many are there?

A. How many what?

Q. Carcinogens.

A. In what?

Q. The cigarette brand that I mentioned in the last four questions, Camel Light 100.

A. You know, you've got to be a little more clear on your questions. If you are specifically asking how many constituents that are thought to be carcinogenic in Camel Light 100, is that your question?

Q. What I asked was -- and I'll repeat it again for you.

31

A. Okay.

Q. I'd like you to identify for me the carcinogens which have been identified in the way that you have described RJR identifies its carcinogens which are present in the Camel Light 100. You told me you don't know as you sit here. So I asked you about how many are there?

A. No, that's -- you have taken some bits and pieces of what I've said. I said I don't know specifically for Camel Lights 100 the extent of the chemical analysis that's been conducted at Reynolds. We've done extensive Camel analyses on a variety of tobacco-burning cigarettes at all tar levels, and I think by extrapolation we know pretty well

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what should be in Camel Lights 100. But again, as I sit here today, I don't know the detail extent of chemical analysis for that one specific brand style. I can sure give some idea about the various constituents that are present in tobacco-burning smoke.
Q. I just want to talk about Camel 100.
A. Okay, fine.
Q. And my question is can you give me your best estimate as to the number of carcinogens in that brand?
A. Okay. As judged by what list, the IARC list or the Surgeon General?
Q. By RJR, and they can refer to anyplace they want. I just want to know how many carcinogens RJR has identified

by whatever, by whatever process are in their Camel Light 100s?
A. There's a large, there's a number of constituents that R.J. Reynolds has measured in a variety of tobacco-burning cigarettes that are on the IARC and Surgeon General's list.
Q. Large number, can you give me some idea of the parameters of this large number?
A. Well, you can look at the Surgeon General, who claims there's somewhere between 43 and maybe 53 constituents.
Q. What does RJR think?
A. We look to the Surgeon General and the IARC list.
Q. The Surgeon General, you said what, 43 to what?
A. I would say between 43 and 53 constituents.
Q. And IARC says how many? Different numbers?
A. Similar.
Q. Similar? All right. Now I didn't give a time, but perhaps you understood I was asking now. Is that what you understood? My question was the number of carcinogens now.
A. Well, there's several things I didn't understand about your questions, but thank you for clarifying that.
Q. Is that what you gave, carcinogens now?
A. Well, I think tobacco-burning cigarettes, you know, produce a number of carcinogens. I think that's fair for now

or five years ago or ten years ago.
Q. Including in Camel Lights 100? Because that's what I'm asking about.
A. Including now, including in that specific brand.
Q. Okay. Now in Camel Light 100s and five years ago and ten years ago, you are estimating somewhere between 43 and 53?
A. That's what I said.
Q. Okay. Now which of the items on here -- you don't have -- these aren't listed on this Premier specific mainstream constituent analysis; they're not, they're not grouped by nitrosamines, but which ones are?
A. I don't understand your question.
Q. Which ones of those are nitrosamines?
A. Which ones are nitrosamines? NNK, NNN, NAT, NAB, those are the main ones.
Q. More than ten years ago, can you give me an estimate for any period of time as to how many carcinogens were in the Camel Light 100?
MR. LATHAM: Object to the form of the question as vague.
THE WITNESS: I'm not sure I understand your question. If you are asking does burning tobacco produce

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these same constituents, the answer is yes, whether it's ten years ago or five years ago.

34

BY MR. BROWN: Q. How about over ten, that's what I'm asking.

A. Again, burning tobacco produces a variety of constituents; that's certainly not going to change over time. The levels certainly change over time as one goes into cigarette decline.

Q. Well, now I know about constituents, but I'm asking about carcinogens. Are you telling me the same estimated number of carcinogens, 43 to 53, were in Camel Light 100 more than ten years ago?

A. No reason to think otherwise.

Q. Okay. And have they ever been higher?

MR. LATHAM: Object to the form of the question.

BY MR. BROWN: Q. It is a little vague, let's go back to 1960. Have they ever been higher since 1960 at any period of time from 43 to 53?

MR. LATHAM: Object to the form of question, still vague.

THE WITNESS: I'm sorry, you will have to start over.

BY MR. BROWN: Q. From 1960 to the present time, has there ever been a period of time in which there are more carcinogens that can be found in the tobacco smoke coming from a cigarette than 43 to 53?

A. Depends on which particular brand and style you are

35

talking about. There are different levels of tar yield from different cigarettes, and consequently dramatically different yields of all these constituents.

Q. I haven't left Camel Light 100.

A. Well, see, you didn't say that, so please be specific.

Q. I see you are a skillful expert witness, trained and experienced in how you pick your way through the questions, so I'll try to be as clear as I can.

MR. LATHAM: Object to the form of the question.

BY MR. BROWN: Q. We'll start in 1960.

A. I really resent that. I'm a scientist, okay? I'm trying to be clear and specific with you because I'm a scientist, so --

Q. Well, that's one viewpoint at the table?

From 1960 through the present time in the Camel Lights 100 would you estimate there has ever been more than 43 to 53 carcinogens?

A. It's hard for me to answer because Camel Lights 100 didn't exist in 1960.

Q. Well, start the year they existed. When did they come in, sometime in early '80s, was it?

A. Camel Lights was introduced in 1977.

Q. All right. From 1977 on, did Camel Lights 100s ever have more than 43 to 53 carcinogens?

36

MR. LATHAM: Object to the form of the question.

THE WITNESS: You are asking a very, a very general question, and I have already made it clear that one burns tobacco, you get the same general composition of smoke. So by extension of that, you know, the chance is there's no reason to think there would be more. There's probably constituents that haven't been measured in smoke yet, and that's why scientists are working hard trying to understand

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smoke even better.
BY MR. BROWN: Q. Okay. Camel Lights 100s comes in in 1977?
A. I said Camel Lights was introduced.
Q. Camel Lights?
A. I said Camel Lights was introduced in 1977. I don't remember the specific introduction date for Camel Light 100.
Q. Has there been any significant difference in the contents of carcinogens between the two brands?
MR. LATHAM: Object to form of the question.
THE WITNESS: Between which two brands?
BY MR. BROWN: Q. Camel Lights and Camel Lights 100.
A. I don't understand that question. Can you rephrase that?
Q. Okay, maybe I don't understand something about

37

those two brands. There's a brand called Camel Lights, correct?
A. Yes.
Q. And there's a brand called Camel Lights 100?
A. Uh-huh.
Q. So those are two different brands?
A. Those are two different brand styles.
Q. Now during the years when they both existed, which would have started what year?
A. Again, I don't remember the specific introduction date for Camel Lights 100, the introduction for Camel Lights was in 1977, as I recall.
Q. Fair enough. Now whatever years they both existed, would it be your opinion that there was significant or there was not significant differences in the number of carcinogens between the two brands?
MR. LATHAM: Object to the form of the question.
THE WITNESS: There's similar tar products. My judgment is there would not be dramatic differences between the yields of these various constituents between those two particular brands.
BY MR. BROWN: Q. Okay. Is there any other differences between Camel Lights and Camel Lights 100s in terms of the carcinogens that would in any way impact the safety of the cigarette?

38

MR. LATHAM: Object to the form.
BY MR. BROWN: Q. For example, the quantity of the carcinogen, the delivery somehow of the carcinogen or any other aspect?
A. I think in the answer I just gave you to your earlier question I said the tar yields were similar between the two brands, the levels of constituents delivered from those two products would be similar.
Q. Okay. What since 1977 has RJR done if anything to reduce the carcinogens in either of those two brands?
A. We've continued to make modifications to the design to further lower tar yield and thus reduce the levels of those constituents.
Q. Called general reduction?
A. In a general sense, yes.
Q. That's what you call it, yes, general reduction?
A. Yes.
Q. Okay. So general reduction, if I understand it correctly, is you reduce tar and that generally reduces all

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the constituents, including carcinogens; is that the idea?
A. General reduction is the reduction of tar, and as a consequence of that, all the constituents in smoke are reduced more or less to the same degree.
Q. Okay. Have you done any specific reduction of the carcinogens since 1977 in either one of those brands?

39

A. I'm not aware of any particular specific reduction technologies that have been introduced into either of those two brands.
Q. Are you aware of any cigarette manufacturer outside of RJR who has done any specific reduction research or actually been able to bring off specific reduction of the carcinogens in their brands?
A. I think there's been a lot of research in the area of specific reduction or selective reduction, and not only at Reynolds but I believe with some of my competitors as well as in laboratories that are outside the industry.
Q. Okay, let's go back to RJR. So you are saying you have done research into specific reduction of carcinogens at RJR since 1977?
A. We've done quite a lot of research in selective reduction of a variety of constituents, including some that are thought to be carcinogenic, and we've done considerable amount of work looking at alternative designs to affect dramatic reductions like Premier and Eclipse.
Q. But I'm just talking about these brands. I'm just talking about Camel.
A. You asked me a general question; I gave you a general answer.
Q. That's fair, but I want to be clear and perhaps I wasn't. I'm talking about Camel 100s or Camel Light 100s or

40

Camel Lights, which I think one of those started in 1977 and at some point they were both out there on the market. Am I right?
A. Both of them have been on the market for some time.
Q. Okay, just give me a general idea of what kind of research have you done with the view of having specific reductions of carcinogens since 1977?
A. You want general descriptions of research?
Q. Just general descriptions.
A. Sure, be glad to. We've done quite a lot of work looking at tobacco, quite a bit with tobacco additives to affect a reduction or a change in the chemistry of the smoke. We've continued to do quite a lot of work looking at selective reduction materials that might be applied to a filter, for example to selectively remove some constituents from the smoke. We continued to look at unconventional cigarette papers to try to change the pyrolysis characteristics of tobacco. So there's been a number of general avenues that we've actually put a lot of research into.
Q. Let's take those three, and then if there are any more, we'll ask you about it. With respect to additives, are you talking about withdrawing additives or adding additives which would change the chemistry of what occurs in the burning process?

41

A. What I said we've done a lot of work looking at tobacco additives to try to change the pyrolysis and combustion of tobacco ultimately to change the chemistry of the smoke. Now what that means is we've looked at, for

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example, different types of salts that might be applied to the tobacco that would dramatically change the combustion or pyrolysis characteristics.
Q. Have you looked at the additives in the sense you have just described for the purpose of determining whether or not would you have a different effect from combustion in terms of producing carcinogens?
A. Yes.
Q. And have you found any additives can be removed or added which would reduce carcinogens?
A. We found that some additives when applied in tobacco do change the combustion characteristics that change the relative proportion of some of the constituents. They don't eliminate, to my knowledge, any of the constituents but they do change the relative proportion. Of those we've found that there's limited consumer acceptability or other issues that are involved with whether or not we can go forward.
Q. Well, let's not go there right yet.
A. Sure.
Q. I understand what you are saying, but let's try to stay here on this one subject. It wasn't clear to me in

talking about additives in your last answer, did you say that both by -- well, first of all, did you say by adding additives you have determined that constituents are not removed but some are lessened in amount?
A. What we're talking about is combustion additives specifically for the purpose of modifying the combustion or pyrolysis. Examples are salts, inorganics salts. So please don't confuse this with additives that might be used in cigarettes, in commercial cigarettes to accomplish certain taste characteristics or orals taste signatures.
So, would you ask the question again? I'm sorry.
Q. Sure. I think you have told us that you have researched the adding of additives in, the addition of some additives to see whether the chemistry that arises out of the burning would have some impact on the constituents, and I'm asking specifically about carcinogens, and you said your research indicates they're not removed but some might be lessened; is that correct?
A. I think what I said was there was a change in the relative proportions of a variety of the constituents in smoke, and I don't believe any of the constituents have been completely eliminated. And there are other questions about the use of some of these, these inorganic salts that we have, so --
Q. Well, I didn't miss what you said. You didn't say

that your research indicated by adding you could lessen the amount of carcinogens, but you apparently said that it might change their proportions, their relative proportions; is that right?
A. That's what I said.
Q. Now explain that further, relative proportions in what context?
A. If you have a series of constituents that you are measuring in smoke and you add certain salts, for example, to the tobacco, you change the combustion characteristics and you change the relative amounts of these constituents that you are looking at.
Q. I didn't understand the answer. I was asking for you to describe what you mean by change the relative proportions and the context of how are proportions changed by

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adding additives which you have researched?
A. I think I just answered. I said you change the relative amounts of these constituents.
Q. Let's talk about carcinogens only. First of all, has any of your research indicated that by adding additives, some additive, more than one additive, you can reduce the carcinogenic, the quantity of carcinogens in the cigarette?
A. Are you talking about the sum of all measured carcinogens or all known carcinogens?
Q. No, I'm talking about specific carcinogens. Have

44

you discovered in your research there is any way to lessen the amount of carcinogens by use of additives?
A. But you are lumping that together in one big summation of all carcinogens by the way you have asked that question.
Q. No biggie. Carcinogen.
A. Okay, please pick one.
Q. Okay, NNN. No, I don't want to do it specifically. I'll ask you to do that. Is there any specific carcinogen which your research indicates can be lessened by the addition of other additives?
A. By the addition of some of these experimental salts we've been talking about.
Q. Or anything, any kind of additive. And I'm not going to restrict you to salts; I'm not restricting you to salts.
A. All right. Well, let's talk, since you bring up the question about NNN, not a tobacco additive but we have examined ways to reduce NNN in Burley and flue-cured tobacco by change curing practices, is what I said.
Q. And you just departed from additives.
A. Right.
Q. Let's stay with additives.
A. But what I tried to tell you a minute ago is that we've met, we've seen some changes in the relative

45

composition of the smoke of these constituents. We've run into problems. You didn't really particularly want to hear about that, but we did. And so then you asked, well, have you seen any differences? So I'm giving you an example of where we have.
Q. All right, but you left my subject; you went to flue, the way you cure --
A. Fine.
Q. Let's go back to additives.
A. Okay.
Q. All I'm talking about here is adding additives and then researching in the combustion whether that lessens the amount of any particular carcinogens in the smoke. Have you done that kind of research, first, regardless of what you discovered?
A. We've looked at a variety of constituents in smoke where a combustion modifier or in particular certain salts have been added to tobacco to try to modify the combustion characteristics, and we see changes in the relative composition of constituents in the smoke.
Q. Well, you have said that several times now.
A. And you keep asking the same question over and over.
Q. This may surprise you, but I actually understand that sentence.

46

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A. Good.
Q. But I want to move you beyond that sentence. I want to know if whether or not, first, have you done research to determine whether adding additives will have the effect in the combustion process of reducing any, the amount of any specific carcinogen? Have you done that kind of research?
A. Don't you understand, that's the point of what we're talking about here, because our goal --
Q. If you answered about a year ago, I think I would --
MR. LATHAM: Don't be argumentative.
THE WITNESS: Don't you understand the goal of what we're talking about is to reduce or eliminate those things.
BY MR. BROWN: Q. I don't understand anything; that's why I'm here, to question and find out.
A. And I'm here to try to help you.
Q. That's good. I'm glad to hear that?
Additives, have you researched whether or not you can reduce the amount of any specific carcinogen by adding an additive to your cigarette?
A. Yes, we've researched that.
Q. Okay. And have you found that any specific carcinogen can be reduced in that method?
A. By using some types of, particularly salts, one can reduce some but increase others.

Q. Okay. Have you used that research to reduce the quantity of carcinogens which are in the smoke of the brand I've been talking about, either Camel Lights or Camel Lights 100?
A. Have we used it commercially?
Q. Yes.
A. No.
Q. I guess when you say used commercially, that takes it into the world of the brands. I'm talking about that puts us on the same page?
A. Those are two commercial brands.
Q. Okay. Why haven't you used it in those two brands?
A. There are a number of practical issues, in particular adding these salts to tobacco, our job is to simplify the chemistry, and some of these salts actually add to things to the tobacco. That's one issue. And the other is what we talked about just a minute ago, some things go down, some things go up, and we're not sure whether that's the right thing to do.
Q. Well, has there been a decision as to whether or not you should use this process to reduce carcinogens or is that something that's still pending?
A. We're talking about research that's gone on for a number of years, and this is just one example of the types of research that's gone on. Again, our job is to simplify

chemistry, not make it more complex. When we see one constituent go down and another constituent of concern go up, that's, that's that makes, you know, a very difficult decision to go forward because of the uncertainty of the consequences of that.
Q. I didn't understand the other reason. You gave us two, one was the idea of constituents go up and constituents go down in your research?
A. Sure.
Q. You don't get a positive reduction without increase somewhere else apparently?

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A. I'll be glad to give you more examples if you like. That may help you.
Q. We can come back to that, but what's the other reason you haven't used it? You gave me two. xx
A. There's concerns about putting certain types of salts on tobacco. Let me give you an example to help you. Palladium chloride, if you put palladium chloride on tobacco, you can see some relative changes in the constituents of smoke. There's some concerns about putting palladium chloride on tobacco because that is a new material and I think we don't feel comfortable with that.
Q. Okay. Have you also done research in removing additives to determine whether that removes the amount of any specific carcinogen?

49

A. What kind of additives are you talking about?
Q. Any kind.
A. Are you talking about additives for taste and flavor?
Q. No, I'm talking about any additive that you are now putting in your brands or have put in your brand over time. Have you done any research to see, if you took out one or more of them, that would have the impact of reducing carcinogens?
A. We've done studies like that.
Q. And did you determine that you could reduce specific carcinogens by removing some additives?
A. No. If you reduce those additives, what we see is similar to smoke chemistry, and we see similar biological activity from smoke.
Q. And biological activity means cancer-producing activity?
A. Biological activity means the results of a variety of biological assays, laboratory assays or assays involving animals.
Q. You mean activity which will result in cancer, is that what it means?
MR. LATHAM: Object to the form of the question, asked and answered.
THE WITNESS: That's not what I'm talking about.

50

What I'm talking about, there's a variety of laboratory measures where one sees certain end points in either in vitro or in vivo test, and what we see is when we take additives completely out of a cigarette, we see no difference in smoke biological activity by those measures.
BY MR. BROWN: Q. So you have concluded, I take it, at RJR that you cannot reduce carcinogens by removing certain additives?
A. We don't see changes in the chemistry when we remove the additives. We was don't see changes in biological activity by a variety of assays; it's simple.
Q. But I think my question is a little different. Has your research indicated you can lessen the amount of any specific carcinogen by removing additives?
MR. LATHAM: Object to form of the question, asked and answered.
THE WITNESS: I've already said we've looked at chemistry and we don't see any differences in the chemistry. We've looked at biological testing; we don't see differences in biological testing.
BY MR. BROWN: Q. That leaves open whether or not you can lessen the amount of carcinogens. What does

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chemistry mean to you?
A. It means a lot of things, but let's take any specific carcinogen you want.

51

Q. Have you been able to determine whether any of those carcinogens can be reduced by removing additives?
A. I'm telling you we've looked at chemistry which included some carcinogens and we've not seen any differences.
Q. Any differences in what respect?
A. Any respect.
Q. Reduction of what?
A. Look, I don't understand. I don't understand why you don't understand this. I'm telling you we've compared --
Q. I think I understand it; maybe that's the problem. But I'll give you a good reason why we're going around and around: You won't answer my question.
A. I answered the question.
MR. LATHAM: Object to the form to the question.
THE WITNESS: I answered your question several times and I'll answer it once more.
BY MR. BROWN: Q. Maybe you think so. Let me rephrase the question. I understand that apparently you are saying that biological activity is not different by the taking out of certain additives, you have said that. Is that what you meant to say?
A. That's what I meant to say.
Q. Okay, and I understand it. Now, my question is different. Can the quantitative amount of any specific carcinogen, regardless of whether it makes an impact of

52

biological activity, can it be reduced by the subtraction of one or more additives?
A. And I told you that we did chemistry evaluations on a cigarette without any additives and a cigarette with our flavor additive packages, and we've seen no difference in the chemistry.
Q. So you see no differences in quantity of the amount of carcinogen?
A. That's right.
Q. And you also see no difference in the biological activity of those carcinogen?
A. By the measures we've looked at so far, that's correct.
Q. And that's the research where you remove the additive and then look to see what the impact is?
A. Yes.
Q. And it's also what you have found, is it, with respect to adding additives?
MR. LATHAM: Object to form of the question.
BY MR. BROWN: Q. Or when you add additives?
MR. LATHAM: We've been through it a long time, Mr. Brown. We've talked about filter additives and he described what that was, so you are misstating testimony trying to confuse the witness. It's probably a good time to take a little break.

53

MR. BROWN: If you want.
(Recess taken.)
(Whereupon, Exhibit 4 marked.)
MR. BROWN: We're back on the record, and for the record, we have marked Exhibit 4, which is 4A to 4LL, and these were the charts that I was moving through. I didn't complete going through them for the record, but now that we

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have them all marked and they're going to be part of the record, I will not go any further.
Q. All right, back to the deposition here. In the most general way, could you just give me a brief laundry list of all of the things that in your opinion RJR has done from the time you got there in 1977 to try to create a safer cigarette.
MR. LATHAM: Objection, it's overbroad.
THE WITNESS: That's a big question.
BY MR. BROWN: Q. I don't need any lengthy description of any particular one. You just give me enough of a description so we both know what you are talking about; then you can move to the next one.
A. All right, I'll give some general, general approaches that we've taken; you can explore any one of those that you'd like.
Q. Sure.
A. Doing extensive research in selectively, in

54

selective removal of various constituents through -- and we've already talked about some work on tobacco additives that we've tried to effect that. Filter additives has been a large area of investigation for selective removal of certain constituents.
Q. Filter additives?
A. Filter additives.
Q. That confuses me a little bit. You don't mean a chemical you are putting in, or do you?
A. It may be a chemical; it may be a particular material that's added to a filter to try to selectively remove. I think there are a variety of ways to do that, or approaches that have been investigated.
Q. That's research. You said research of selective removal and now it's research on filter additives.
A. I thought that was your question, what type of research we've done.
Q. No. What the question is, what have you done to make a safer cigarette? And research is certainly within that.
A. Then we're together.
Q. All right.
A. So the whole area of selective reduction of constituents has been a major approach. Of course, general reduction, which you have already mentioned, has been a major

55

approach, and that is looking at a variety of technologies to try to reduce the total level of tar and nicotine, thereby reduce all constituents simultaneously. There's been quite a lot of work in the area of changing tar and nicotine ratios in an attempt to make safer cigarettes. And we've had multiple projects trying to figure out ways to do that in an acceptable product form.
And then the other major area that we've, that we've been very active in is tobacco heating technology where we either completely heat tobacco and not burn or primarily heat tobacco and burn only a very small amount.
Q. You mean a curing process, you are talking about?
A. No, I'm talking about not burning of the cigarette, so we're talking about a very different cigarette design of air heat or primarily heat tobacco rather than burn tobacco.
Q. Sorry, heat or what?
MR. BROWN: Can you read that back?
(Whereupon, record read.)

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BY MR. BROWN: Q. Okay, I've got five. Are there any other general areas where RJR has made in your opinion an effort to make a safe cigarette?
A. Those are some of the major areas. I mean there are a number of sub-elements of that. For example, some of the work that we've conducted over a number of years and continuing to conduct to reduce nitrosamines by modifying the

56

curing process of tobacco. There's -- I mean those are some of the major elements.
Q. Whenever you tell a lawyer that that's some of the elements and he's asked you for all of the elements, you can probably anticipate that he's going to come back and say, well, what are the other that you haven't mentioned?
A. I think you originally asked me what were the major approaches we've taken or something like that.
Q. I didn't mean to interrupt you. In recognizing there could be quite a few sub-subjects that's grouped underneath these subareas. Do you think you have named -- well, you have named six, I guess, if we call curing, so there's six general areas: Research on selective removal, research on filter additives, general reduction to reduce total tar and nicotine, tar and nicotine ratios in an acceptable product, heating technology, meaning to heat but not to burn, and finally the nitrosamine reduction through a curing process that change --
A. Right, I think you must have misunderstood, though. If you will turn back in your notes to the top, we were talking about selective removal.
Q. Yeah.
A. And you must have written down filter additives. That's one approach of selective removal.
Q. So okay. That's 1-A?

57

A. Okay. And you remember, we've already talked about tobacco additives as another approach to selective removal.
Q. That's on here somewhere?
A. We've already talked about it. I think I mentioned it in my answer too for this specific question. I said, for example, we've already talked about tobacco additives, and then there's also filter additives to try to effect a selective reduction.
Q. I didn't mean for you to exclude anything we've already talk about.
A. Sure.
Q. So we'll put that in here, No. 2 and then my numbers won't change. So 1 would be research on selective removal, 1-A would be research filter additives, and then we have the additive research. Would that be a nice general way to talk about that?
A. Are you talking about tobacco additives for selective removal?
Q. That's another selective removal method?
A. Yes.
Q. Okay-doke, that will be B, additives added or taken out to determine whether that will have a lessening of --
A. I think you are confusing -- you are misunderstanding this.
Q. All right.

58

A. In an attempt to try to selectively reduce certain constituents in smoke --
Q. Uh-huh.

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A. -- we've looked at a variety of approaches, for example, using certain types of materials in filters to effect removal.
Q. Okay. You notice I'm starting over here. Go ahead.
A. Another example is to add certain types of additives to tobacco, for example, salts to try to effect a reduction in those constituents. So those are two examples of selective removal, not to be confused with our earlier discussion about the differences between flavor additives, with and without flavor additives, which I think you were probably misunderstanding that just a second ago.
Q. Okay, let me see if I've got it this time.
A. Okay.
Q. Because it's kind of a basis to come back and ask you some more questions.
A. Sure.
Q. So my question was, if I can restate it somewhat close to what I originally said, was for you to give me in general the major areas of efforts which in your opinion were efforts by RJR to make a safer cigarette. And I told you research would certainly be included in that, and so you said

59

first research of selective -- for selective removal, and as examples you told me about research for filter additives, and then you told me about at least a part of what we had discussed earlier, adding additives like salts, various salts. And I guess the only place I'm confused so far is we talked about a lot of other things, too, like withdrawing additives to determine whether or not carcinogen amounts would be lowered. Is that another area?
A. But my understanding is you were talking about flavor additives in particular, the comparison of cigarettes that have flavor additives versus cigarettes that don't have flavor additives. Am I correct?
Q. I don't mean to make any restrictions of limitations on the kinds of additives you might take out or might add. Maybe that would include flavor additives, I suppose, but I didn't mean to make any qualification that way.
A. Okay, fine.
Q. So would the discussion we had about taking additives out to determine what the chemical consequences would be, would that be an area where you have done research under the selective removal process?
A. That's not really selective removal in the sense that we've talked about it.
Q. Okay.

60

A. Again, I'll say once again, we've done experiments to evaluate cigarettes with and without flavor additives to see if there are any differences, and that's what we were talking about before. It's not an element of selective reduction, no.
Q. Let's put that No. 2. Tell me about that. I don't think we've talked about that, that I know about.
A. I think we did because you were asking me about specific chemical changes that resulted from that.
Q. You thought I was asking about flavor additives and I wasn't. I was being more general than that.
A. Okay. Well, see it wasn't clear to me, so --
Q. Okay. So tell me about the flavor additives, things you just described in generality.

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A. Since you are asking about what general approaches we've taken toward making reduced risk cigarettes or safer cigarettes.
Q. You got it.
A. The first is selective removal.
Q. Right.
A. I have given two examples under that.
Q. Right.
A. The second one would be general reduction.
Q. All right.
A. The third one would be tar to nicotine ratio

61

modification.
Q. Okay.
A. A fourth one is tobacco heating technology.
Q. Not burning?
A. Not burning. And then I think I gave you a fifth one, which is tobacco specific nitrosamine reductions through curing modifications.
Q. Would those five areas in general cover the major efforts made by RJR?
A. In a general sense. There are quite a few elements under each one of those, but yes, in a general sense.
Q. Okay. You gave me some examples of selective removal, those two that we've just talked about, but let me ask you to give me the complete list of selective removal research or any other efforts you have made that fall within selective removal.
A. Well, I'm not sure I can give you a complete list. I can certainly expand that. Under selective reduction attempts, we've looked at a variety of different filtered materials, not the standard filter. We've looked at adding materials to various filtered materials, including the current cellulose acetate.
Q. How's that different from the first one?
A. The first one is -- well, let me back up. Cigarettes, most cigarettes since the advent of filtered

62

cigarette have used cellulose acetate filters, a few have used paper filters. We've looked at other filters besides cellulose acetate and paper to see what extent we can selective reduce certain compounds. So, a materials change.
Q. Is that A?
A. If it's A on your list.
Q. Okay, so that's materials used?
A. Okay, so the materials used in filters.
Q. All right.
A. Then we've also looked at certain types of additives to filters. For example, plasticizers, triasadine can selectively reduce some compounds when applied to cellulose acetate. Another example might be ion exchange resin added to filters. So you take a standard filter, add ion exchange resin to -- we have compounds you can selectively reduce and a variety of others. So you are adding something new to the current filter.
Q. Sounds like a chemical of some kind as opposed to material.
A. Well, most everything is a chemical, yeah, yeah.
Q. But materials are in 1.
A. But to draw the distinction, the first one we were talking about was using different materials of construction for the filter.
Q. Okay.

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63

A. And the second one is adding something to the filter, like triasadine or like some ion exchange resin or something else. So you are keeping -- or we could say you take standard cellulose acetate filter, now you add ion exchange resin to it; you know, how does that simplify the chemistry of the smoke?
Q. Okay. More? Any more on selective reduction?
A. Well, there's a number of filter designs that we've evaluated as well trying to effect a selective reduction. For example, impaction filters. So not only -- you know, before we were talking about different materials; here we're talking about different designs of the filters.
Q. Okay.
A. Okay. So those are really the major ones.
Q. ABAC under selective removal, and there's no other major --
A. Those --
Q. -- effort under selective removal?
A. Well, those are the general approaches. I'd say that, you know, we've done a lot of work on cigarette paper as well to see how that can affect selective changes in the chemistry.
Q. I haven't heard you mention it. Where would ventilation fit? If it does fall in here or does it fit --
A. It doesn't really fit in this list; it fits under

64

general reduction.
Q. Okay.
A. So maybe you want to turn to general reduction now.
Q. If that's No. 2. I just want to make sure under 1, No. 1, research of selective removal, I have got them all, and I've got four of them here: filter in materials used filter diagram designs, paper?
A. I don't think that's an all inclusive list, though. I mean, for example, we've looked at different types of tobacco blends to selectively reduce certain compounds.
Q. Explain more of that. You might as well stay here on this one. What do you mean by that? What have you done?
A. Well, for example, the question is can you, can you design a different tobacco blend that would reduce the level of, say, nitrosamines, for example? And we've conducted research in that area.
Q. Okay.
A. Okay. Then so I think that in a general sense defines the major areas of selective reduction that we've worked on.
General reduction, if you are ready?
Q. All right.
A. Okay. The most obvious approach to general reduction is filtration.
Q. Is this research you are talking about now or

65

something you have done in a commercial cigarette?
MR. LATHAM: Object to the form of the question.
THE WITNESS: Well, filters are present in commercial cigarettes.
BY MR. BROWN: Q. Yeah, right.
A. So, you know, the, the techniques have not only been researched thoroughly but in some cases have been applied to commercial products.
Q. In filtration?
A. Yes.

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Q. Okay. I hate to go back, but in terms of any of these items you gave me under selective reduction, have any of them been placed into the commercial cigarette?
A. Yes.
Q. Which ones?
A. Certain filter additives. For example, the use of triasomine to selectively remove certain phenols, the use of cellulose acetate to selectively reduce or selectively reduce certain phenols and other polar compounds as well. We have had commercial products using other filter additives, such as a carbon in a product called Tempo, so that was a commercial product. Those the main ones.
Q. Not leaving No. 1 yet, has any, has any selective removal process been placed into Camel Light 100s?
A. Cellulose acetate is used as a filter which

66

selectively reduces phenols and certain other polar compounds; triasomine is also used in the Camel Light filter, Camel Lights 100 filter. That last selectively reduces phenols and certain other polar compounds.
Q. Okay. Anything else in the selective removal area which has found its way into the Camel Light or Camel Light 100s paper?
A. Well, the papers used in Camel Lights 100 don't selectively reduce certain compounds by themselves, so, no. I think those are the main ones, the nature of the filter material, the plasticizers used on the filter for Camel Lights.
Q. What size?
A. Plasticizer used on the filter for Camel Lights 100. Those are the two.
Q. New word.
A. That are selective tools, selective reduction tools.
Q. You said plasticizer?
A. Plasticizer.
Q. What is that?
A. It's a material, it's a liquid that's added to the filter, number one, to make the filter more firm. It also, by virtue of its polar nature, will selectively reduce phenols.

67

Q. Okay, let's go the general reduction then. Now you are using filtration there again. Under general reduction, what are you talking about more specifically?
A. The use of filters to remove tar and nicotine.
Q. What specifically have you done in filters to do that?
A. Well, we've used filters on cigarettes to reduce tar and nicotine.
Q. You are just talking about using a filter, period?
A. I'm not sure I understand your question.
Q. I'm not understanding your answer, which is how come you don't understand my question.
A. Well, there may be a correlation here.
Q. Okay. Filters went on sometime when, in the '60s?
A. The first successful filter cigarette in the U.S. was introduced in 1954.
Q. Well, Camel Lights and Camel 100s both occurred on or after 1977, from what I understand you have told me here today.
A. I believe Camel Lights was introduced in 1977.
Q. And the other one later but --

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A. And Camel Lights 100, I don't remember their exact introduction date.
Q. But later?
A. I would say.

68

Q. Okay. So in those two brands, has there been some different filter placed upon those brands which are different than filters that existed before 1977? You have described the cellulose acetate and the reduction of phenols. Did that --
A. Cellulose acetate filters were in place before the introduction of Camel Lights, if that's what you are asking.
Q. Right. When did they go into effect?
A. Cellulose acetate filters were first introduced in 1954.
Q. Okay. From 1977 on have either of the Camel Lights or Camel Light 100s received any change in the filter in any way, design, materials, any chemical additive, anything?
MR. LATHAM: Object to the form of the question, it's overbroad.
THE WITNESS: And the filters used on Camel Lights have been changed from time to time. The particular filter item as purchased from the supplier can change in an effort to change the filter efficiency to change the pressure drop or draw characteristics of cigarette. I think, as with any commercial product, there's going to be small changes.
BY MR. BROWN: Q. Well, has there been any significant -- any specific and in your opinion significant change in the filters from 1977 forward in the context of making a safer cigarette? And I'm talking about in those

69

Camel brands.
A. I would say that in a general sense the tar level for those products has been decreased a bit over the years, the tar yield.
Q. Right.
A. The make-up of the filter, although there's been some small changes, there's probably not been substantial changes, either in the type of filter material of the filter, probably a slight increase in the filter efficiency.
Q. Maybe I should ask the next question this way. I should say, why don't you take me to the next general reduction method that in your opinion has had the biggest impact on the reduction of tar and nicotine since 1977, if there are any in those two Camel brands, Light and Light 100s.
A. Are you talking about -- I'm not sure I understand your question. Are you asking for techniques that have been developed and implemented since 1977?
Q. Right.
A. See, our major general reduction techniques such as filtration, air dilution, the use of expanded tobacco and so forth, have been in place since before 1977. What we've done is refine them and using them better today.
Q. Okay. Before we get back on to the track of since 1977, in all the years from, let's say 1960 to now, has there

70

been more than one significant effort by RJR which has in fact made a significant reduction in tar and nicotine in commercial cigarettes?
A. Since when?
Q. 1960. Let me -- so the agenda is not concealed, I understand there's been a -- I don't know what it is, 60

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percent reduction I've heard, 40 percent reduction in tar and nicotine, so some year back in those days; is that correct?
A. There's been more than 60 percent reduction since the '50s.
Q. Okay. And I assume some of that may have occurred because of efforts after 1960 by RJR?
A. Yes.
Q. Okay. Tell me what those are. And as you go through them, tell me what you think the most substantial impact on tar and nicotine reduction has been since 1960 that --
A. I'm not sure I understand what you mean by the most substantial impact. If you are asking what technologies have we developed since 1960 that are important in general reduction, is that your question?
Q. Yeah, technology developed since 1960 that has made a substantial reduction in tar and nicotine.
A. Okay. The first one that comes to mind is the use of expanded tobacco. The second one that comes to mind is

the use of air dilution, filter air dilution.
Q. Is that ventilation?
A. Since 1960.
Q. Ventilation, you are talking about?
A. Filter ventilation, yes.
Q. That's the holes in the porous paper?
A. Right.
Q. Okay, go ahead.
A. Another technique that has been used since the '60s is go into even more porous cigarette papers for tobacco rod ventilation or tobacco rod dilution.
Q. Okay.
A. Another technique that's the -- well, it's not a technique that's, that's been developed since the '60s but has been important in what's happened since the '60s, reducing the weight of tobacco burned. There have been major reductions in the overall tobacco weight in a cigarette rod.
Q. But not since 1960? I don't understand that.
A. No, I'm saying there has been but it's not a technique that was developed after 1960s because we actually started reducing the amount of tobacco burned in cigarettes before 1960, but I'm telling you it's been an important tool that we've used since 1960 as well.
Q. Okay. Well, you developed the technology before 1960, but are you saying you have been reducing the weight

since 1960?
A. We've continued to reduce the weight through cigarette maker improvements and understanding how to better do that and still maintain consumer acceptance.
Q. All right. Any more? I've got four here.
A. All right, let's see. I think those are the main ones.
Q. Expand on tobacco, expanded tobacco. Is that something you started to use after 1960 for reduction of tar and nicotine?
A. We invented it after 1960.
Q. Can you tell me about when?
A. The patents were roughly 1965. I think the first implementation of it in the market was about 1970.
Q. Air dilution, when did you start to do that?
A. Well, there were a number of small brands that used air dilution in the '60s. I think it became very popular in

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cigarette design in the late '60s and early '70s.
Q. When the Camel brands I have been talking about, the Lights and the 100s, came into effect, did they immediately get the state of the art ventilation?
A. Yes.
Q. And I'm sorry I have to ask you again, you said late '60s or '70s?
A. Late '60s, early '70s.

73

Q. More porous paper, that's something you started after 1960?
A. No, it actually began back in the '50s but I think we figured out better how to do that in the '60s and even into the '70s.
Q. So in the '60s and '70s you were continually doing more in that area?
A. Sure, as we do in other areas as well.
Q. Has there been any changes in the porous paper since the end of the 1970s?
A. Since the end of the '70s or early '80s, I would say not substantial differences. Pretty much reached the limit there.
Q. Okay, weight reduction, when did that reach its peak? Was that by the end of the '70s too?
A. I am not sure what you mean by reach its peak. this is a continuing effort.
Q. Still going on?
A. A continuing effort to, to modify cigarette makers, to look at the interaction between particular blends and the way you run them on the cigarette makers to reduce the amount of tobacco burned during smoking.
Q. Now would you say those four, are you saying in your opinion those four reduction techniques of tar and nicotine accounted for most of the 60 percent reduction which

74

has occurred since the '50s?
A. No, I didn't say that, because what you did was limit it to things that we really implemented after the '60s, or tried, you know, primarily implemented after the '60s. the other thing that's missing here is refinements and improvements to filtration technology.
Q. Okay, so --
A. So that probably is No. 5.
Q. I'm going to put this under post-'60s and I'm going to put three -- pre-'60s, I guess, and the --
A. Let me try to clear this up.
Q. Okay.
A. While we introduced filters before 1960, I think throughout the '60s and '70s and even today we continue to try to make better filters, more efficient filters, and I think a lot of the, a lot of the reduction in tar and nicotine over the years has been as a result of developing improved filters together with these other four techniques that we've just talked about.
Q. So that started before the '60s but it goes on?
A. It goes on.
Q. Okay. Maybe we can isolate the 60 percent a little better. When did those 60 percent start? What's the base issue?
A. Well, if you go back and look at say, a 1954

75

cigarette and compare and compare the sales-weighted tar yields in 1954 versus sales-weighted averages today, that

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represents more than a 60 percent reduction.
Q. Today being 1999, 200, what?
A. Today's 2000.
Q. Okay, to now. 60 percent plus reduction in tar and nicotine, okay. Actually, it's 60 percent in both or a different percent for --
A. No, it's more than 60 percent for both now. Tar and nicotine aren't reduced to exactly the same degree, but it's comparable.
Q. Right. Okay. By 1980 had most of that reduction been accomplished?
A. In the sales-weighted averages, is that what you are talking about?
Q. Yeah.
A. Yes.
Q. Okay. I have five methods which in your opinion were substantial causes for the reduction of tar and nicotine, and if there are any more, I'd like to ask you to give them to me now. Expanded tobacco, ventilation, more porous paper, weight reduction and more efficient filters?
A. So you are expanding this to in a general sense as opposed to putting time limits on it or time elements on it?
Q. That's right, anything that has reduced -- I guess

76

there's a time limit on it. I understand there's a time limit on it because I'm talking about what were the substantial contributors to that 60 percent reduction.
A. Okay. Well, the one that occurred, of course, before the '60s but we've continued to refine is the use of reconstituted tobacco as well. That's been a factor. Those are the main ones.
Q. Okay, we've got them, okay. Now does that take care of general reduction or is there some more?
A. Those are the main techniques for general reduction.
Q. Okay. So my outline, I've got No. 2, general reduction; A, filtration. I'll call B those six things we just went through, and that's it; that's general reduction?
A. Although there's overlap in A and B, of course, because we talked about filtration in B as well, right?
Q. In which B? You talked about filtration in the reduction -- yeah, right, they're in here somewhere. How come I don't see it?
A. We talked about improvements to filtration.
Q. You did. Yeah, way right up in the first part, so I thought that it was a separate subset. Well, filtration is in there regardless of what letter I gave it.
A. Sure.
Q. All right, let's go on to 3, which is tar and

77

nicotine ratio modification. Explain what you mean by that?
A. The approach to reducing the risks of smoking through TN is a slow change. Tar and nicotine ratio changes to maintain some reasonable or moderate level, medium level of nicotine yield and reduce the tar yield as low as possible.
Q. The idea being to keep enough nicotine in the cigarette to obtain satisfaction from the customer but at the same time reduce the tar that you are reducing your nicotine?
A. The approach is to maintain enough nicotine in the cigarette to keep that cigarette consumer acceptable.
Q. Okay.
A. And reduce the tar, which contains the variety of

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constituents, some of which we've already talked about, get those down as low as possible.
Q. When you use constituents, are you talking about bad stuff or are you just talking about everything in there?
A. Well, that's a fair question. Constituents, of course, is a very general term, and when I say smoke constituents, I'm talking about all of the chemical compounds that are present in smoke.
Q. Okay.
A. There are constituents that are of concern; we've talked about those. There are some that are carcinogenic; we've talked about some of those.

78

Q. Are there constituents that are not carcinogenic, that are still of serious concern?
A. Sure.
Q. What, give us a list of those what are.
A. Well, I think there's -- I don't know what you mean by serious concern, but there's certainly biological importance, or we believe that they are. Some are compounds like certain aldehydes, that can be irritating. There are some compounds in smoke that are free radicals and may contribute to oxidative stress. There are compounds that may be important in their own and not carcinogenic, sure.
Q. Okay. So the tar and nicotine ratio, how have you -- let's go back to 1960. Was RJR trying to accomplish this modification of that ratio by 1960?
A. I think the idea had come up at that point probably briefly. I don't, I don't think it really got to a critical mass until the late '60s, early '70s, and there are quite a number of theories about how to go about this. There were theories about the approach itself. There were even scientists outside of Reynolds, outside of the tobacco industry who were suggesting this as a viable approach toward a safer cigarette, so I would say, you know, it really came together probably late '60s, early '70s.
Q. Does that mean it was implemented into a commercial cigarette by that time?

79

A. No, what I'm trying to say is that was the period where intense research began.
Q. Was it ever implemented?
A. No. Not, not in itself in the sense that we're talking about. And I'll --
Q. Sorry.
A. No, go ahead.
Q. So it's not found, whatever this technology was that you researched, is not found in the Camel Lights or the Camel 100s?
A. That's correct.
Q. Did the research come up with some different hypothesis about how it might work?
A. I'm not sure I understand that.
Q. Did you come up with some theories as you might do this, this might work, you might do this and it might work?
A. Well, we came up with a number of approaches to try and accomplish this change in TN ratio, is that your question?
Q. Sure.
A. A number of approaches we looked at, sure.
Q. Okay. Why weren't they implemented?
A. Because we found that if you change the TN ratio, the consumer acceptance drops off dramatically. Consumers

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didn't like them.

80

Q. Why is that so? Explain that to me.
A. Well, I'm not entirely sure why that is so. The empirical observations are that if the tar to nicotine ratio is changed, either to lower levels or to higher levels, those cigarettes are judged is unacceptable by smokers. Let me be a little more explicit. If the tar to nicotine ratio is moved to higher levels --
Q. That's the opposite direction from what we're talking about. You know, I'm confused by what you mean by higher to lower levels because we're talking about ratio. Could you explain to me what you mean?
A. Let me try to simplify it.
Q. You need to.
A. Let's talk about the tar to nicotine ratio. That's the level of tar relative to the nicotine. And the goal that we've been talking about is to reduce that dramatically. So you are reducing the tar dramatically, you are maintaining some medium level of nicotine. So the ratio goes way down.
Q. Right.
A. What we find is for a given, for a number -- you know, all these approaches that we've looked at, if you change the tar to nicotine ratio very much, either to lower values, which is the goal we are talking about, or even to higher values, which is, I think, the wrong direction, those, either of those products are consumer unacceptable. I don't

81

know exactly why. It affects the taste characteristics and the overall acceptance.
Q. When you say higher or lower values, I'm still not following what that means, because I'll tell you why I'm confused. Because you are talking about ratios. When you say higher value, what values are you talking about?
A. So the ratio confuse you?
Q. Well, when you put "ratio" in there and are talking about higher value, I don't know what that means.
A. Okay, I don't know how to help with that, sorry.
Q. Well, let me put it this way. Are you talking about higher or lower amounts of nicotine?
A. What I, what we were talking about was the goal was maintaining some medium level of nicotine to keep consumer acceptance of this product --
Q. Okay.
A. -- and reduce the tar level as low as possible. In a variety of attempts to do this using different approaches, we found those products to be unacceptable.
Q. What was this medium nicotine level that -- well, let me withdraw that. Did you, was there selection of some nicotine level that would constitute this medium level?
A. Well, I think, you know, there's been a variety of different projects within Reynolds looking at different ways to do it and, yes, there have been different levels of

82

nicotine that we've tried to achieve while reducing the level of tar.
Q. Okay.
A. So I would say there's different levels that we've looked at.
Q. Has RJR determined what minimum level of nicotine is acceptable to the consumer?
A. Actually there's been research to try to determine just that. And I think the answer that we found so far is I

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don't believe there is a minimum level that's acceptable. What's important is how much tar relative to how much nicotine, and that's what I'm saying. When the ratio changes, the acceptance characteristics of those products are different and those products are unacceptable.
Q. Why were they --
A. But I don't believe there's a minimum level of nicotine that's acceptable.
Q. Why would ratio make a difference to consumer acceptance as opposed to nicotine level in the cigarette?
A. Because I think it's important to the overall taste characteristics of the cigarette that there be a balance, and understand that's not what we wanted to find out. That's not the answer we wanted. But I think the practical answer is there must be a balance and if the balance isn't right, if the tar is too low relative to the nicotine, those products

are judged too harsh, too irritating and too strong. If the balance is on the other side and the tar is higher compared to the nicotine, then those products are judged too weak, too mild, too bland.
Q. I may not have heard the first part. You said if the nicotine is too high it's considered too bland?
A. No. What I said is if the tar level relative to the nicotine is high compared to commercial cigarettes, then those products are judged too weak, too mild, too bland.
Q. And this is with the same nicotine level in both?
A. The first approximation we can say yes, sure.
Q. So these number means nothing but, for example, if you had a nicotine level you rated at 5 and you tried to figure out how to -- and you had tar -- is tar always higher than nicotine?
A. Yes.
Q. You had a tar level of, say, 10 just for, to use numbers. You found that at some point that maintaining the same level of nicotine at the 5, if your tar was too high, it was harsh and if it came down too far it was weak?
A. No, that's backwards.
Q. I guess I really missed it.
A. Let me take your example.
Q. All right.
A. Let's assume that we've got a cigarette that's 10

milligrams, so it's a light cigarette.
Q. That's a nicotine?
A. 10 milligrams tar.
Q. Tar, all right.
A. And 1 milligram of nicotine.
Q. Okay.
A. Okay?
Q. All right.
A. Let's say we build a cigarette that continues to have 1 milligram nicotine yield, so the nicotine is the same, but we reduce the tar from 10 down to 5.
Q. Okay.
A. That cigarette will be judged by smokers as too harsh, too strong, and unacceptable.
Q. I thought that's what I said.
A. No, you said the reverse.
Q. Oh, okay.
A. Now let's go back to our base. We have a 10 milligram tar cigarette, 1 milligram nicotine. Let's increase the nicotine level from 10 to 15.

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Q. Oh, oh, I just got lost.
MR. LATHAM: Tar. You messed up, you misspoke.
THE WITNESS: I'm sorry, I apologize, I misspoke.
We start out with 10 milligram tar cigarette, 1 milligram nicotine. Okay. Now let's change cigarettes and

85

make the tar level 15 instead of 10, keep the nicotine yield at 1. That cigarette will be judged by smokers as too weak, too mild and not strong enough.
BY MR. BROWN: Q. Taking the tar up to 15?
A. Yes.
Q. That's increasing tar?
A. Because the ratio of the tar to nicotine is important to defining consumer acceptance; that's the point.
Q. So both those examples, they were weak?
A. No. If you reduce the tar, maintain nicotine, those cigarettes are too strong and too harsh.
Q. Okay. You might have said weak because I wrote it down, but okay.
A. If you go the other direction -- let me try to simplify this for you. There's a very narrow range of tar to nicotine that's consumer acceptable. And what we found in our development work and all of our experiments is if you get outside that range, either on the high side or the low side, those products are not acceptable.
Q. So it looks like if the ratio between tar and nicotine become, as they become closer, there is a strength or a harshness that begins to develop?
MR. LATHAM: Object to form of the question, misstates testimony.
THE WITNESS: No, no, I don't think that's right.

86

What we find is that consumer acceptable products all fall within a certain range of tar to nicotine yield levels.
BY MR. BROWN: Q. All right.
A. And if you get outside of that empirical range, we find that those cigarettes are not acceptable.
Q. I understand that in a general sense.
A. And in spite of the fact that we really wanted to accomplish the goal of reducing the tar and maintaining the medium nicotine.
Q. Now is the key to all of that some minimum level of nicotine?
A. No, I don't believe, I don't believe so. I don't believe there is a minimum level of nicotine; I think the ratio is critical.
Q. Then aren't they both critical?
A. Well, I think they both are critical, but the ratio is critical to consumer acceptance. I mean we have a range of products on the market today that go from, say, 1 and a half or 1.8 milligrams of nicotine all the way down to less than 0.01 nicotine. Now there's different ranges of consumer acceptance, but those are commercial products. I don't think there's a minimum level of nicotine, to answer your question; I think the ratio is critical.
Q. But that consumer acceptance, that has something to do with sales of those various brands too, doesn't it?

87

A. The very low tar and low nicotine products are not as popular as, say, the Lights, the Lights products, like Camel Lights. So if you go to ultra tar products that are 1 milligram tar and say a tenth of a milligram nicotine or less, those have limited, or less appeal to smokers.

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Q. Okay.
A. But they're still out there and doing pretty well. The difference is that smokers are not as accepting of the ultra low tar products as they are of the lights products.
Q. What research has RJR done to determine the impact of the different levels of nicotine on their sales?
A. On their sales?
Q. Uh-huh.
MR. LATHAM: Object to the form of the question.
THE WITNESS: I'm not sure I understand that question. There have been studies with consumers looking at the effects of different levels of tar and nicotine, looking at different ratios of the two, for example. But the commercial products where we actually have them in the market and are selling them to smokers all have similar tar to nicotine ratios.
BY MR. BROWN: Q. The ratio's the same, similar?
A. Similar.
Q. But the quantity of nicotine has -- haven't you researched that to determine what quantity of nicotine

reflects itself in the highest sales?
A. I'm not aware of experiments exactly like what you are suggesting.
Q. I'm talking more like --
A. If you look in the marketplace -- again, I'll -- you know, I have already said this; I'll say it again. If you look in the marketplace, the very low tar products have some acceptance among consumers, but it's not as great as for Lights. And right today as we speak, the largest segment of the market is the Lights segment.
Q. I guess what I'm trying to get around is, isn't it true that while balance is important, nicotine is where it's really at in terms of the sales levels?
MR. LATHAM: Object to form of the question, vague.
THE WITNESS: I disagree with that.
BY MR. BROWN: Q. So you think that the higher nicotine content cigarettes do not sell at the highest level?
A. The highest nicotine cigarettes on the market today are in fact the smaller segment of the market full player higher tar, higher nicotine cigarette, the smaller category than the lower tar, lower nicotine.
Q. So Lights are the leader in the market?
A. The Lights are the leading category in the market today.
Q. When did you say Lights came in, was it early '80s?

A. No, I didn't say it at all.
Q. I think I said it; you may have nodded. I don't know if you did or not.
A. No, I don't doubt that. I don't think I would nod to that.
MR. LATHAM: Ask the question again.
BY MR. BROWN: Q. When did the Lights come in commercial?
A. One of the first successful Lights was in fact a Reynolds product; it was called Vantage; it was introduced in the market around 1969 or thereabouts, or 1969-70, in that neighborhood.
Q. Where has Camel Lights placed in the market in terms of the highest sales within the RJR brand, Camel Lights --
MR. LATHAM: Object to form of the question.

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BY MR. BROWN: Q. -- in the '80s and '90s?
A. And a brand style.
MR. LATHAM: Object to the form of the question as vague.
THE WITNESS: In the '80s and '90s where has Camel Lights been placed in the what?
BY MR. BROWN: Q. Within your market, within -- well, what are the Camel Lights the highest selling RJR brands in '80s and '90s?

90

A. No.
Q. What is the highest sale?
A. Well, I think there's -- I mean this is a difficult question to answer because you are speaking about a specific brand. Sometimes I can tell you about the whole brand family. The Winston for many years through the '80s and into the '90s was our largest brand family.
Q. Okay.
A. Today our largest brand family is the Dural.
Q. Okay. And tell me where Winston and Dural in the '80s and '90s, how did they compare in tar and nicotine to the Lights?
A. Oh, we have different styles within that family. So for Winston we have a full flavor Winston or higher tar Winston; we have a Lights Winston, and then we developed an ultra lights Winston. The same as we have a Camel full flavor called a Camel Filter Extra Lights and Camel Ultra Lights.
Q. Or if you lumped all the Lights together, do they outsell all the other brands offered by RJR?
A. If you lump the Lights together, of all the Reynolds products today, that's the largest category for Reynolds and it's also the largest category for the market.
Q. Can you give me some parameter of how much larger they are?

91

A. I've seen the numbers; I can't I'm any -- I'd just be guessing at this point. It's larger than the full flavor. We can certainly go to the Maxwell report. I'd refer you to that if you really want the details; that's where the numbers come from.
Q. Tell me what the Maxwell report is.
A. The Maxwell report is an independent survey of the tobacco market which actually goes out and looks at the cigarette market and determines which cigarettes are doing well, which are declining, and what the total snapshot looks like.
Q. Is that a reliable source for that information?
A. Yes, it's a reliable source.
Q. Okay. I guess, bottom line on the tar to nicotine ratio modifications, is you looked at it, you researched it, and then for the reasons you have discussed, you didn't do anything about it?
MR. LATHAM: Object to the form of the question; it's argumentative.
BY MR. BROWN: Q. In the commercial sense.
A. That we didn't do anything about it is not fair.
Q. In the commercial sense.
A. It's not in Reynolds' commercial products.
Q. That's what I meant.
A. That's not what you said.

92

Q. It was implied.

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Okay, we'll go to No. 4, which is the heating technology. Heat, don't burn. When did that or has that ever gone into commercial brands?
A. Yes.
Q. When?
A. The first tobacco heating product was introduced in test market in 1988.
Q. What's the name of that brand?
A. 1988.
Q. Oh, okay. The brand?
A. Premiere.
Q. That's still sold?
A. Nope.
Q. When did it stop?
A. It was -- the test market was discontinued, I believe, in 1989.
Q. Where was it sold?
A. It was sold in three locations: Phoenix, Tucson and I think St. Louis. I'll have to go back and look at my notes.
Q. So it went out as a test product?
MR. LATHAM: Say again?
BY MR. BROWN: Q. It went out as a test product to see if would it gain consumer acceptance?

93

A. As we do any product, it was a commercial product that was introduced into a test market. We do that for any new product.
Q. Now one of these things you gave me which we talked about a little bit, "Premiere - Specific Mainstream Constituent Analysis, there's -- I think it's right on the top here. Why don't you look at the black and white version; it's 4A?
MR. LATHAM: Give him the exhibit number.
BY MR. BROWN: Q. 4A. Tell us what the reference cigarette was there that you are talking about in this chart?
A. This chart shows certain constituent comparisons between the Premiere and 1R4F reference cigarette.
Q. What does 1R4F mean?
A. It's a reference cigarette used by those who study cigarettes and cigarette chemistry or smoke chemistry. It's a reference cigarette that's manufactured by the University of Kentucky.
Q. Is there more than one?
A. More than one what?
Q. Reference cigarette.
A. Sure.
Q. How many are there?
A. Well, there are a number of reference cigarettes depending on the types of experiments that one wants to

94

conduct. There are at least four Kentucky reference cigarettes, University of Kentucky reference cigarettes. For example, there's a 1R4F, there's a 1R2F, there's a 1R5F, and then I believe there's another one. There are other types of reference cigarettes that are used by researchers depending on the nature of their research.
Q. What's the purpose of the reference cigarettes?
A. To provide a stable benchmark, if you will, so that scientists can compare from one lab to another.
Q. So on this chart you are comparing your Premier to the 1R4F?
A. In this chart we're comparing Premier chemistry to

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1R4F smoke chemistry.
Q. And what's the purpose of that?
A. To show that Premiere offers substantial reductions in the smoke chemistry.
Q. Reduction in smoke chemistry means what?
A. It means reductions in a variety of constituents in the mainstream smoke.
Q. You mean it's safer than the 1R4F?
A. I didn't say that. I said there are major reductions in the smoke chemistry.
Q. Okay. Let me find out if you would say that. Does this comparison show that the Premiere was safer than the 1R4F?

95

A. I think for Premiere, I don't think there was sufficient evidence to say that it was safer than 1R4F. I think there's major differences in the chemistry. There were major differences in a number of biological assays as well.
Q. Do you think the 1R4F is safer than the Camel brands that are sold?
A. I'm not sure I understand your question. I mean these are different products; they're -- I don't understand your question.
Q. Well, if you compare a 1R4F cigarette to, say, the Camel Lights, is either one of them safer than the other?
A. There's no reason to think that one is safer than the other.
Q. Why do you say that? I mean what's your basis for saying that?
A. Well, because they have similar chemistry in the mainstream smoke. There's no reason to think that they should pose any less risk than another cigarette.
Q. How was the 1R14 -- or 1R4F designed? I mean who decided what to put in it and -- kind of a dumb question the way I framed it; let me try it again. First of all, who designed the 1R4F?
A. Scientists at the University of Kentucky in fact design and actually manufacture and sell these products, these cigarette as reference cigarettes. They're designed to

96

be reproduceable so that one can go back in and exactly reproduceably make new batches of them. Again, to provide a stable benchmark for comparisons of chemistry.
Q. Now has RJR ever compared the 1R4F against any of the Camel brands the way did you here with Premiere?
A. I think there's been some comparisons of certain smoke chemistries as compared to certain types of Camels with 1R4F.
Q. Was that done in the science department? It must have been done while you were there because --
A. Well, let me give you an example. If you go to the Premiere monograph, I think you will find some of the data comparing a commercial product with 1R4F. I think that commercial product was Camel Light.
Q. Is it possible to compare Camel Light to Premiere in the sense that Camel Lights or Camel Light 100s information about what is in there is available to an outsider? I mean you could do it?
A. I don't understand what you just asked.
Q. Okay. RJR could compare Camel Lights 100s to Premiere; I think that's obvious that you can do that.
A. Is your question can we conduct the chemical analysis design in comparison of Premiere with Camel Light

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100?
Q. You have the ability to do that?

97

A. Yes.
Q. Have you ever done it?
A. With Camel Light 100 specifically in this type of comparison?
Q. Yeah.
A. I have never seen such a comparison.
Q. Have you done any kind of comparison between Camel Light and 1R4F?
A. I think I just answered that in one of your earlier questions, that if you go to the Premiere monograph, you will find some data about a Camel Light commercial product, which happens to be Camel Light compared to 1R4F and compared to Premiere.
MR. LATHAM: I am going to object. Your question was have we ever done comparison with Camel Lights with 1R4F?
MR. BROWN: Yes.
MR. LATHAM: Is that how you understood the question?
THE WITNESS: Between Camel Light --
MR. LATHAM: And 1R4F.
THE WITNESS: -- and 1R4F?
MR. LATHAM: Yeah.
THE WITNESS: No. Head to head like that, no.
BY MR. BROWN: Q. What conclusions do you draw from 4A that you understand you are going to testify to in

98

trial?
A. With this tobacco heating technology in the form of Premiere, there are major reductions in the smoke chemistry.
Q. And that's all you are going to say?
A. You asked me what conclusions. That's the conclusion.
Q. Okay.
A. I may be more specific and pointing out particular reductions for individual constituents or whatever. I don't know yet.
Q. But what's the point of that conclusion? How does it bear on this case, if you know?
MR. LATHAM: Object to the form of the question as vague. Calls for legal conclusion.
THE WITNESS: I've been asked to testify about the research and development that's been conducted at Reynolds and this is part of that.
MR. BROWN: Okay. Let me ask you to read back your conclusion and see if I understand it if I hear it slowly.
(Whereupon, record read.)
BY MR. BROWN: Q. What do you mean by major reductions in smoke chemistry, reductions of what?
A. Reductions in a variety of specific constituents in the mainstream smoke.
Q. For the good or the bad or insignificant?

99

A. Reductions I believe are good.
Q. Reductions of any constituents is good?
A. Less ought to be better.
Q. Less is better, a Jerry Brown approach when he was governor.
All right. Reduction in carcinogens, does that show on this chart?
A. There are some here that we've already talked

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about.
Q. And if you just look here, I guess it looks to me like there are significant reductions, am I right?
A. That's my point exactly.
Q. Okay. In your opinion can those reductions only be made by using the heating technology that was used in Premiere?
A. I wouldn't conclude that that's the only way. I think this is the way that we've approached it because we believe this has the best chance of actually being technically successful as well as being successful with consumers.
Q. When did you say you stopped selling it?
A. I believe the test market was discontinued in 1989.
Q. What's happened since then? Is there still research going on to determine how to get these kind of reductions either within the heat exchange area -- or not

100

heat exchange but in the heating methodology or some other way?

MR. LATHAM: Object to the form of the question as vague.

THE WITNESS: Well, if your question is what's happened since then, I think the simple answer is what we did was learn from that test market, launch into new development program to try to overcome the deficiencies of this product with the consumer, developed new tobacco heating approaches, and that ultimately led to another product which is currently in test market.

BY MR. BROWN: Q. What's the name of that one?
A. Eclipse.
Q. When did it come out?
A. It came out in the test market in, I am thinking 1996, I believe.
Q. Is it still out?
A. Yes.
Q. Where is it being sold?
A. The major test market is in Chattanooga.
Q. Is there any reason in your opinion to believe that the Eclipse is a safer cigarette than any of your commercial brands you sell otherwise?
A. I think it may be. There's certainly major reductions in the chemistry. I think through the extensive

101

biological testing that we've conducted it may be.
Q. It's not clear what you mean when you say major reductions in the chemistry. What does that mean?
A. Exactly the types of stuff that we were seeing in Exhibit 4A where you see major reductions in a variety of constituents.
Q. Okay. You think a major reduction in constituents is basically a safer cigarette?
A. That's not what I said.
Q. All right.
A. What I said was that together with major reductions in biological assays, altogether, I think, suggests this is a step in the right direction.
Q. What's a major reduction in biological assays mean?
A. If you remember back at the early part of this deposition, we talked about a variety of biological tests or biological assays that could be conducted.
Q. Right.
A. We've conducted a number of smoke from Eclipse and

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we see differences compared to a tobacco burning cigarette.
Q. Okay. The implication I got, which was wrong, I guess, I thought you were saying the testing was a cause of it being safer, but you didn't say that. What you are saying is that the reduction of the chemistry in your opinion equals safer?

102

A. That's not what I said. I corrected you the last time you said that.
MR. LATHAM: Misstates the testimony. You asked him what the basis is; he told you the basis. If you listened, you would know what he said.
MR. BROWN: Is there any reason for you to believe I'm not listening?
MR. LATHAM: The very next question you asked, I have heard you describe the basis led me to believe you are not listening.
MR. BROWN: I guess if the failure to understand is a failure to listen, I'll try to get my understanding up to a higher level here.
Q. What is it about Eclipse which you think may be safer than the other brands of cigarettes you are selling?
A. My answer to that question is based on the major reductions in chemistry together with, together with --
Q. Okay.
A. -- the results of biological advertising, biological assays that we've conducted where we see major reductions in that as well.
Q. Okay, I understand how you put it together now.
Would it be accurate to say that you would expect a major reduction in chemistry to be safer and that seems to be brought out by your biological assays?

103

A. Let me clarify this for you. If there are major reductions in chemistry, I think that's certainly a step in the right direction. But the chemistry itself wouldn't lead anybody to conclude anything about the relative risk of these cigarettes by itself. But if you have major reductions in chemistry and you see major reductions in biology, the weight of the, the weight of the information together may lead one to conclude that, that --
Q. Okay.
A. -- Eclipse may be a reduced risk.
Q. Okay, but I think you are saying that with a major reduction in chemistry you would expect the test going further and show that in fact it was safer.
A. Well, I think one can make predictions. One might say biological testing based on chemistry. Is that going to hold 100 percent of the time? Probably not, but you can certainly make predictions.
Q. Okay. Now let me go back to the -- at the start of this deposition you gave me a list of the titles you had. You started from 1977 through 1980 sometime. You were a senior R&D chemist. What did you actually do?
A. Plan and conducted laboratory experiments looking at cigarette design, selective filtration and general reduction techniques.
Q. Were you working on any of those items that we

104

talked about here?
A. Yes.
Q. Which ones did you work on?
A. Selective reduction, general reduction techniques

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and cigarette design.
Q. All right. And when you moved to R&D program manager, did you do anything differently?
A. Well, I assumed more responsibility for planning projects and including other people in those projects, so I would say it increased responsibility. Continued to conduct research of my own in the areas of cigarette design. Also in the early '80s added to the work some work in the area of aerosol chemistry and aerosol physics.
Q. I can't read my own writing. What did you do in 1983?
A. I was --
Q. Master?
A. Master scientist, yes.
Q. How did that differ from being an R&D program manager?
A. Well, again, more responsibility without question.
Q. Same areas of work though?
A. Well, throughout -- let me make it clear. Throughout my employment at Reynolds my responsibility has been in the area of cigarette design. It includes some other

105

areas, like I just said, aerosol chemistry and aerosol physics. It included combustion research, but the main emphasis has been cigarette design and selective reduction, general reduction, TN ratio changes, tobacco heating technology and all the things that we've talked about. It's just that each, each promotion or each level change in fact added on more responsibility, it added on more supervisory responsibility but clearly more responsibility in setting directions for programs and projects and setting the direction for our R&D group.
Q. But as I hear you testifying, essentially the subject matter stayed the same; you just got higher and higher in the hierarchy of who was running the projects?
A. The subject matter clearly stayed the same. That's been my focus throughout Reynolds, throughout my work at Reynolds.
Q. Okay.
A. On cigarette design.
Q. I think you just mentioned -- maybe you mentioned them all in another answer, but what is encompassed within cigarette design the way you use that phrase?
A. Well, actually that's a good question.
Q. Finally. What time is it? Jeez, it usually takes me longer than this.
A. Cigarette design encompasses a number of areas and

106

one is not only the obvious construction of a cigarette, how to build a cigarette, but there is consequences of that in terms of chemistry and the performance of the cigarette, burn rates, pressure drops. There are a variety of things that all go together into that. To understand and actually work in the area of cigarette design, you really have to have a working knowledge of combustion and how combustion occurs, how pyrolysis occurs and what the chemical consequences of that are. You need to know a lot about the physics of smoke and the dynamics cigarette smoke itself particularly, so it's actually a broad, broad area.
Q. Okay, I guess when you say how to build it and the consequences, that pretty much covers everything, doesn't it?
A. How to build it and what, what cigarette design means to the overall performance of that product. That's

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probably a better way to say it.
Q. Did you have anything to do with this Ames testing that occurred, I guess, around the mid 1990s?
MR. LATHAM: Object to the form of the question as vague.
THE WITNESS: What specifically are you talking about?
BY MR. BROWN: Q. There was a study that was published and we were shown it out in the trial -- I guess nobody in this room can put their hands on it today because I

107

guess we both left our copies out in the courtroom; is that right?
MR. LATHAM: It's one of our exhibits.
MR. BROWN: Right. Do you happen to know the exhibit number?
MR. LATHAM: I think it's 5376.
MR. BROWN: That's anyway, your best recollection.
Q. And that's a -- you reviewed this, this published study that was done in the mid 90s, haven't you, that we're talking about here?
A. I think a lot has been done with Ames. I'm not sure specifically what you are talking about. If you show me the document, I'll --
Q. Unfortunately, we don't have it here. Neither one of us have it here and the courts are locked up today.
Well, let me take a look at some things that were brought to me. So I'll do that a little later.
Are you aware of any testing that was done up until the time, let's say through the 1980s -- let's see, at the end of the 1980s you were a principal scientist, correct?
A. That's fair to say.
Q. You had gone and you had been working on pretty much the same subjects but you had been getting more senior and senior. By the end of the 1980s had there been any testing, whole product testing on the whole cigarette to

108

determine whether it was a potential cause of lung cancer?
MR. LATHAM: Object to form of the question.
THE WITNESS: What do you mean, whole product testing? I don't understand that term.
BY MR. BROWN: Q. You take the cigarette and you test it without testing component parts; you test it all, the whole product; you test whether or not it is a potential cause of lung cancer.
MR. LATHAM: Object to the form of the question.
THE WITNESS: I am still not sure I understand. I understand what you said about taking the whole product together.
BY MR. BROWN: Q. Right.
A. I mean we do testing on products, assembled products all the time, whether it's chemistry or biology or whatever.
Q. All right.
A. But I'm not sure what you mean by whole product testing.
Q. Well, let me ask you this. In your opinion does the Camel Light or the Camel Lights 100 cause lung cancer?
MR. LATHAM: Object to the form of the question.
BY MR. BROWN: Q. If smoked sufficiently, in sufficient quantity?
MR. LATHAM: Object to the form of the question.

109

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THE WITNESS: I'm not sure what you mean by smoked in sufficient quantity.
BY MR. BROWN: Q. Well, I don't think -- I think if you ask me how many, whether one cigarette would cause lung cancer, I could probably give you a very clear answer, no, but given some proper or some defined amount of smoking that, you can define for yourself if you like.
A. So what you are saying is --
Q. Does it have the potential to cause lung cancer?
A. So what you are saying is that there's a dose response relationship?
Q. Exactly. Given the proper dose response, is it your opinion that the Camel 100s and Camel Lights are a potential cause of lung cancer?
MR. LATHAM: Object to form of the question. It's outside the scope of Dr. Townsend's expertise, but you can answer the question.
THE WITNESS: Well, I think cigarette smoking is risky. I think it's a clear substantial risk for developing lung cancer. And cigarette smoking may cause lung cancer in certain individuals, but so I would say without question it's a risk, a substantial inherent risk of smoking and it may cause cancer.
BY MR. BROWN: Q. When did you first arrive at that opinion?

110

A. Well, I think I arrived at that opinion a number of years ago.
Q. Okay.
A. Cigarette smoking is a clear risk; it may cause cancer. Obviously it doesn't in all smokers. It's a very complex picture.
Q. Approximately was the year you formed that opinion?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I don't know as we sit here. You know, I have clearly known and have known throughout my adult life that cigarette smoking is a strong risk for lung cancer and other diseases.
BY MR. BROWN: Q. Throughout your adult life, okay. Does that start at 18, by any chance?
A. It depends. It changes, doesn't it?
Q. Well, have how old are you today?
A. I'm 52.
Q. And did you have that understanding, say, by 1960?
A. Oh, I think I did.
Q. What was the basis of your understanding that --
A. That cigarette smoking was risky?
Q. No, that it had a potential to cause lung cancer?
A. That's not I said. I think I have known from my entire adult life that cigarette smoking is risky.
Q. Let's go back to lung cancer. You have already told me that you think it has a substantial inherent risk of lung cancer. You did say that, didn't you?

111

A. Cigarette smoking presents substantial risk of developing lung cancer.
Q. Okay. When did you form that opinion?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I don't know that I can answer that because I don't know a particular time when I formed that opinion. I think I have always recognized that cigarette smoking is a risk for lung cancer, no question about it.
BY MR. BROWN: Q. I think you also said since you

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have been an adult you believed that?
A. Yeah, at least.
Q. So I take it you would have believed it by 1960?
A. Let's how old was I in '60? I'm sure I believe it in '60, but I can't tell you as we sit here what's the very first time I understood and believed this.
Q. Well, 1960? Are you comfortable with 1960, at least by then? That's okay. That at least you knew that. I'm trying to figure out what the -- anyway, go ahead?
MR. LATHAM: Is there a question pending?
BY MR. BROWN: Q. In 1960 you accepted and understood smoking had the potential for lung cancer?
A. I don't know why you are focusing on 1960. I guess I was maybe 13 at the time.

112

Q. Oh. Well, did you know it by the time you were 13?
A. There's no reason to think I didn't.
Q. Well, let's go with 13.
A. Look, you know, if you are trying to focus down to specific times, you know, I've already made it clear what I believe.
Q. Okay.
A. You know, I don't understand the point of this.
Q. Well, with all due respect, you don't have to know, sorry. But let me, let me see if we can get it up to a time when you were an adult. If you are 13 in 1960, I guess you are certainly an adult by 1970, aren't you?
A. Sure.
Q. And then you definitely believed it by 1970?
MR. LATHAM: Object to the form of question.
THE WITNESS: If you are asking in 1970 when I was roughly what 23 years old --
BY MR. BROWN: Q. Okay.
A. -- did I believe that cigarette smoking was risky?
Q. No, I am talking about lung cancer.
A. Okay. Ask your question then specifically.
Q. By 1970 you are 23 years old --
A. Okay.
Q. -- and as I understand what you have already said, you had a definite understanding by that time that smoking in

113

sufficient doses was a potential cause of lung cancer.
A. That's not what I said.
Q. Well, tell me what you did say.
A. What I said was cigarette smoking presents an inherent and substantial risk for lung cancer.
Q. Okay. I thought I restated it accurately, but I guess I didn't.
A. No. And I am sure sitting here today that I was aware of that when I was 23 years old.
Q. Okay. Now you came to work for RJR in 1977, so you were what, 27 years old or so? You were about 30 when you went to work for RJR?
A. Right.
Q. Have you ever smoked?
A. Yes.
Q. When did you smoke?
A. what do you mean, when did I smoke?
Q. How old were you?
A. How old was I when I started?
Q. While you were smoking --
A. No, ask me a specific question.
Q. When did you smoke?

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A. When did I start smoking or when did I smoke? Or what ask me a specific question.
Q. When did you start smoking?

114

A. Thank you. I started smoking when I was approximately, I would say, 27 years old.
Q. Okay. How long did you smoke -- or do you still smoke?
A. I still smoke.
Q. Okay. You started before you went to RJR?
A. Yes.
Q. Okay. Now when you got to RJR in 1977 and, you know, in the first few years, did you find anybody there who didn't believe what you did about the association of lung cancer and smoking?
MR. LATHAM: Object to the form of the question.
THE WITNESS: People that I have worked around at Reynolds have clearly recognized that cigarette smoking is associated with lung cancer and a variety of chronic diseases.
BY MR. BROWN: Q. Okay. And that started from the time you got there in 1977?
A. Yes.
Q. Has it changed over time? I mean have they become more convinced or less convinced or convinced of maybe a greater amount of risk, or what --
MR. LATHAM: Object to the form of the question.
BY MR. BROWN: Q. -- since 1977?
MR. LATHAM: Object to the form of the question.

115

It's speculating on what people think and what they believe.
THE WITNESS: Yeah, I don't understand how I can answer that.
BY MR. BROWN: Q. Okay, fair enough. You probably, you are probably familiar with the firm Phillip Morris' web site where they make the statement that an overwhelming consensus of scientific and medical authority believe that smoking causes lung cancer?
A. I've read portions of that web site. I haven't read the whole thing.
Q. Are you familiar with that, that sentence as I have quoted it to you?
A. I believe I've read that in roughly that fashion. I'm not sure you have quoted it verbatim.
Q. I'm not sure, but I can tell you what, we can read it verbatim so there's no problem about it.
A. It's up to you.
Q. If I can find it in this complicated book of mine. I know it's here somewhere.
I'll read it to you: "There is an overwhelming medical and scientific consensus that cigarette smoking causes lung cancer" and some other diseases, but I'll just stop at lung cancer. Do you agree with that statement the way it's presented in the Phillip Morris web page?
A. I believe that if you look at it, the scientific

116

and medical community, I believe the consensus is that cigarette smoking causes lung cancer.
Q. Okay. So I think you are saying you agree with that sentence, but maybe you are not?
A. I just said what I believe.
Q. Well, that sentence included a statement about overwhelming medical and scientific consensus, which I didn't

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hear in your answer. So let me ask it again and sort of focus on that part of the sentence.
A. Sure.
Q. There's an overwhelming medical and scientific consensus that cigarette smoking causes lung cancer. Do you agree with that?
A. I believe that's a true statement.
Q. Okay. And then it adds other diseases, and let me add those: Heart disease. Do you believe that?
A. I do.
Q. Emphysema?
A. Yes.
Q. And other serious diseases in smokers?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I think that's pretty broad. I think there are a number of chronic diseases that are associated with smoking.
BY MR. BROWN: Q. Do you agree there's no safe

117

cigarette? I am reading that from their web page too.
A. I do believe that there's no safe cigarette.
Q. Okay. Do you believe that cigarette smoking creates an addiction to smoking?
MR. LATHAM: Object to form of the question.
THE WITNESS: Well, I think that depends on how you define addiction. If you use the term the way most people use it today, which means it's something pleasurable that's hard to quit, then yes, cigarette smoking is addictive.
BY MR. BROWN: Q. Okay. Since you began to smoke, give me rough idea of your dose. How much do you smoke a day?
A. It varies a lot. I go for days and don't smoke very much, a few cigarettes. Some days I'll smoke a pack, so it varies quite a lot.
Q. Can you give us an average over a year's time how much you smoke in a day?
A. No.
Q. There's no average you could give us?
A. No. I think it varies a lot. Certainly less than a pack. I smoke Salem Ultra Lights, that's it.
Q. Is there any reason why you like Salem Ultra Lights?
A. I like menthol cigarettes.
Q. Is Salem an RJR cigarette?

118

A. Sure.
Q. Sorry, I have to ask. I am not familiar with the market. Okay.
The web site quotes the U.S. Food and Drug Administration as saying, "The nicotine in cigarettes and smokeless tobacco causes and sustains addiction." Would you agree with that?
A. I think that's overly simplistic. I think nicotine is an important reason people smoke but it's not the only reason people smoke.
Q. What are the other reasons?
A. I think there's certainly a ritual. I think there's, there are behavioral aspects to it as well and there's pleasure aspects to it separate from nicotine. Now I'm not trying to minimize the importance of nicotine because it is important, but it's not the only reason people smoke.
Q. Would you say it was the substantial reason?
A. Well, I don't know what you mean by substantial. I

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say it's important but it's not the only reason.
Q. Let's put it this way. If you took nicotine out of cigarettes, would people smoke?
MR. LATHAM: Object to the form of the question.
THE WITNESS: If you have a cigarette that has no nicotine yield, that's not consumer acceptable, no question about it. But again, I don't think that nicotine is the only

119

reason people smoke.
BY MR. BROWN: Q. Okay, let's talk about your ratio a little bit. In your opinion do you believe that maintaining the right ratio, there's a place where if you bring nicotine down low enough, people won't smoke it?
A. I think there's, there's certainly reason to believe that if you bring nicotine down to extremely low levels, virtually none, that that's not an acceptable product and people will not smoke it.
Q. Okay. Take a break for a minute.
(Recess taken.)
BY MR. BROWN: Q. Okay let's go back on here.
I didn't complete marching up the lines of your promotions. By 1990, as you said earlier, you were a principal scientist and then six years later you became the senior principal scientist. What was the difference between principal scientist and senior principal scientist?
A. Well, simply, we have, we have a dual ladder technical, dual technical ladder at Reynolds, master scientist, principal scientist and senior principal scientist are the three levels of the highest technical ladder, or technical -- technical levels that we have in Reynolds.
Q. Okay.
A. And each one of those adds on much greater responsibility in terms of directing, identifying and

120

directing programs, establishing direction for R&D efforts as well as managing R&D personnel.
Q. Let me ask you, between 1977 and 1987 when you became principal scientist, did you have direct contact with the most senior research scientists at RJR?
MR. LATHAM: Object to the form of the question as vague.
THE WITNESS: In a general sense, the answer is certainly yes. I mean we have a very open working relationship within the R&D department.
BY MR. BROWN: Q. During those years how many Ph.D.s were working in the, in the RJR science departments that you have mentioned?
A. Between the years of '77 and --
Q. When you started at the end of '80.
A. Well, that's hard for me to say at that point in time because it changed a lot. '77 I don't recall. '87 to '90, in that time period we had somewhere in the neighborhood of 600, 650 people in R&D, and probably about a third of that, just ballpark.
Q. Were Ph.D.s?
A. Ph.D. or masters.
Q. Or masters, okay. During this period from 1977 to the '80s did you have occasion to meet with some of the senior executives of RJR?

121

A. Sure.
Q. Under what circumstances?
A. Well, presenting the research results to them,

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presenting proposals for new research. Again trying to, to live up to the responsibility of helping guide R&D.
Q. Was it research that you were involved in that you have talked about here, I guess virtually all away through your career at RJR, was it at least in part substantially aimed at making a safer cigarette?
A. Yes.
Q. And from that can we draw the conclusion that the RJR people recognized that their cigarette was not safe?
A. Well, I think I've already answered that question several times over. Within Reynolds there's no question that scientists understood the risks of smoking and a major part of our job was to reduce those risks.
Q. And those risks included lung cancer, I assume?
A. Yes.
Q. Okay. And so I don't want to overstate it, but was a major part of the research you were doing aimed at reducing the risk of lung cancer?
A. My personal research?
Q. Yeah. Well, I don't know about you personally, but you were supervising a lot of people too; I'll include that.
A. Yes. A major part, a major part of the cigarette

122

design effort which I was responsible for or either conducted myself or others under my supervision conducted was aimed at the risks of smoking, the risks of even lung cancer.
Q. Thank you. I didn't have to ask twice.
A. You are welcome.
Q. We're getting along better, didn't you notice?
A. Sure, we are.
MR. LATHAM: We get along with everybody.
BY MR. BROWN: Q. I know; it's sort of the southern approach. I understand that perfectly; I lived in Virginia, if that helps you out at all.
A. That's pretty far north.
Q. Okay, let's see. In all the time that you have worked at RJR from the time you went work there until up to now, has any senior scientist or executive ever expressed the opinion in your hearing that cigarette smoking was not a cause of lung cancer?
A. I have never had anyone express the doubt that cigarette smoking was a risk for lung cancer as well as other chronic disease. Whether or not cigarette smoking by itself in itself caused cancer, sure, there are people who believe that -- and probably even today -- believe that all of the scientific evidence is not in that definitively shows that cigarette smoke by itself, no other factors involved, causes lung cancer.

123

Q. You said you agreed with the, the Philip Morris web site and that sentence I read to you, so --
A. I believe what I said was that sentence you read I believe was a true statement.
Q. Now I don't think I asked this, but I'll go back and make sure I cover it. How long do you believe that it has been true that an overwhelming medical and scientific consensus believe that cigarette smoking caused lung cancer?
MR. LATHAM: Object to the form of the question, lacks foundation.
BY MR. BROWN: Q. And focus of the consensus of the scientific and medical community, that has been true?
A. Well, I don't know that I can answer that in terms of specific time period. I would say that in a general sense

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the scientific community has concluded that for sometime, but specifically I can't answer that because I'm not an expert in the area of medical research, medical science.
Q. Are you familiar with the Surgeon General's Reports from '64 on up?
A. Some of them. I have read portions of many of them.
Q. Your work requires you to be familiar with some of them?
A. Absolutely.
Q. Apart from your testifying in trial, it requires

124

you to be familiar with it?
A. My work requires me to be aware of the issues around cigarettes, the smoking and health issues in a general sense as a chemist can understand them and, through cigarette design, to try to address those issues.
Q. Would it be your opinion that by the time of the '6r Surgeon General's Report that is referenced by Phillip Morris to an overwhelming medical and scientific consensus that cigarette smoking causes lung cancer was true?
A. I don't know.
Q. Okay. How about by the time of that '69 Surgeon General's Report?
A. Well, again, I really don't know. I'm not an expert in the area of medical research and I couldn't pinpoint when the medical community overwhelming concluded that. I just don't know.
Q. How long have you believed it?
A. That cigarette smoking is a serious --
Q. That the overwhelming medical and scientific consensus believed that cigarette smoking causes lung cancer.
MR. LATHAM: Object to the form of the question.
THE WITNESS: If you are asking how long I've believed that that's a true statement?
BY MR. BROWN: Q. Uh-huh.
A. I would say for quite some time. I mean there's no

125

question in my mind that that's the conclusion that the scientific community has drawn. No question about it.
Q. At least 20 years?
A. I don't know, I don't know. It's clear to me that cigarette smoking is risky. I've known for a long, long time, as I think everybody else does and has. But at what point was, was the, did the medical community and scientific community conclude that cigarette smoking caused cancer? I don't know.
Q. Okay, let me go to something different. Is it your opinion, in your opinion now, is benz-a-pyrene a significant carcinogen?
A. What do you mean, significant?
Q. A strong carcinogen, let me put it that way?
MR. LATHAM: Object to the form of the question.
THE WITNESS: Benz-a-pyrene produces tumors in animal studies. It's listed on the IARC list as a probable carcinogen, if I remember correctly. It's not listed as a Class 1 human carcinogen. The significance of that in biological systems I don't know. I certainly consider it a carcinogen and my job has been to try to reduce it.
BY MR. BROWN: Q. Is it your opinion that there is insufficient amounts of benz-a-pyrene in the RJR commercial cigarettes so that the risk of it being a carcinogen can be dismissed?

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126

MR. LATHAM: Object to the form of the question as beyond the scope his expertise. He's told you 15 times that he's a chemist, not a biologist. You have asked him to give expert opinions about biological issues which is beyond his expertise.

MR. BROWN: Well, I'm kind of blown away by that statement because if he's offered to prove that RJR has been trying to make safer cigarettes, this would seem to fall rather squarely into the middle of that, doesn't it. Huh? I think so. Hearing nothing, I'll proceed.

Q. I mean are you, do you make the contention, is it your opinion that you are going to express in this trial that there's so little benz-a-pyrene in the cigarette that it's not a significant risk?

A. I will not say that in trial.

Q. Okay. Let me turn the cone over a little bit. Do you think it's a significant risk at the present level that it exists in the RJR cigarettes?

MR. LATHAM: Object to the form of the question.

THE WITNESS: I don't know whether benz-a-pyrene by itself is a significant risk or not. It is one of those compounds, though, that it's been my job to try to reduce or eliminate.

BY MR. BROWN: Q. And I guess we can draw the inference that you are trying to reduce it because RJR is

127

concerned about it?

A. We're concerned about a variety of constituents in smoke including benz-a-pyrene which is why we've invested so much to try to reduce or eliminate these compounds, including benz-a-pyrene --

Q. Okay.

A. -- you know. But to say that -- but to ask the question in a way asking me if I believe it has no risk or no importance because it presents at low levels.

Q. That you don't agree with?

A. Absolutely not, because my job is to reduce or eliminate because, we as chemists certainly don't understand the detailed implications of these various constituents in a complex matrix. The toxicologists and I believe the biologists don't even understand the full implications. Our job is to reduce or eliminate those things that might be a problem. So I'm not going to sit here and quibble about whether benz-a-pyrene is probable or not. My job is to eliminate or reduce it as much as possible.

Q. You just said you don't understand the full implications, and I don't want to misstate what you said, but you don't understand the full implications of the presence of these constituents?

A. In a complex matrix like cigarette smoke.

Q. Sure, okay. Do you believe that RJR knows and can

128

identify all of the constituents in its cigarettes?

A. In cigarette smoke?

Q. (Nodding head.)

A. Well, I think R.J. Reynolds has identified many of the smoke constituents. If you are asking me, have we identified everything that's in smoke? Without question, the answer is no.

Q. From a lay standpoint, which includes me, you probably have noticed, I don't understand why it would be difficult to take smoke and analyze it and find out what's in

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there. What's the problem?
A. Well, the problem is it is a very complex matrix. There are thousands of constituents in smoke that are present at extremely low levels, which makes the analytical chemistry exceedingly difficult.
Sorry, go ahead.
Q. Do you believe that RJR knows substantially what is in their smoke? Is there a substantial amount they don't know?
MR. LATHAM: Object to the form of the question, asking for speculation.
BY MR. BROWN: Q. Maybe you can try and phrase your answer anyway you want to.
A. Well, I will. You know, the term substantial is the one that I'm having difficulty with because that means

129

different things to different people.
Q. Right.
A. I would say that we have, we and other scientists outside the industry, some scientists with our competitor companies and Reynolds have identified the constituents that are present, we've identified the constituents that are present in the larger amounts, those that we can quantitate given current analytical methodology. We continue to try to develop more sensitive analytical methodology, and every time we do, we can identify additional compounds. To ask the question have we identified the substantial amount of the compounds in smoke? I don't know. As we continue to improve and refine analytical methodology, I'm sure we're going to find more, and we're continuing to look.
Q. Has RJR done anything to remove the use -- or not prevent, but to encourage the use of tobaccos which are not rich in nitrates, in fertilizers that are not rich in nitrates? Let me go back.
A. Please.
Q. Fertilizers contain -- a lot of fertilizers contain large doses of nitrates, right?
A. There are nitrates in fertilizer, many of the fertilizers.
Q. Then it gets into the tobacco leaf and into the stem, right?

130

A. I think that's fair.
Q. Has RJR done anything to try to change the technique of farming to not use those kinds of fertilizer?
A. To not use nitrate fertilizers?
Q. Correct. Or at least to reduce it.
A. We've looked at a number of, a number of ways to work with the farming community to make sure that they use proper fertilizer application rates, that I told you, that they don't over-fertilize, I mean for nitrate level as for other reasons as well. One of the complications in this is that even ammonia, not nitrate, can be absorbed in a plant and turned into nitrate. So it's a very complex picture. We've done research in the area. We've not had a whole lot of success, frankly.
Q. Success in what?
A. In wholesale reduction of nitrate in tobacco.
Q. How about working with farmers. Does RJR have --
A. That's what I just said.
Q. -- a program where you are working with farmers to try to get them not to use fertilizer that have high nitrates?

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A. What I just said is we've worked with farmers to try to make sure they use the right application rate, not over fertilize. I'm not aware of a case where we've worked with farmers to try to get them to 100 percent walk away from

131

the use of nitrate fertilizer, to answer your question directly.

Q. How about getting them to reduce the amount of nitrate in their fertilizer or to buy fertilizers that have low amounts of nitrates?

A. What I've said is we've worked with them to make sure they use proper application rate and not over fertilize, so in that sense I would agree with that.

Q. Do you think that's an appropriate, a good step, as I've heard a couple times, would be to try to use in farming of tobacco nitrate fertilizer?

A. I think that's very difficult, to reduce nitrate use in farming, including tobacco farming. I think to keep the nitrate level at a minimum reasonable level is, is a good goal.

Q. Are there strains of tobacco that have higher tobacco specific nitrosamines than other strains?

A. I don't believe so.

Q. Do you think that all tobacco has essentially the same amount of T S N A?

A. Let me --

Q. That's TSNA.

A. Let me make something very clear. Green tobacco does not have TSNAs in it.

Q. And the point?

132

A. Then it doesn't follow to me that there's a connection between the use of tobacco that produces less TSNA because green tobacco has no TSNAs. I don't understand the connection.

Q. Is there any reason why -- I don't know what you mean by green tobacco. You mean before it's ripe, before it's ready to be picked, or are you talking about a particular kind of tobacco?

A. Green tobacco is harvested but uncured tobacco.

Q. And it does not have nitrosamines in it?

A. Correct.

Q. Where do the nitrosamines come from?

A. During curing.

Q. You think that's 100 percent true?

A. All the evidence we have suggests so.

Q. Okay. Suggesting that looking at curing might be an important step?

A. Bingo.

Q. Are nitrosamines more substantially in Burley as opposed to bright tobacco?

A. There are higher levels of nitrosamine in cured Burley than there are in flue cured bright. The ratio of nitrosamines is different as well.

Q. Have you research the impact on your cigarette safety if you didn't buy Burley, just used the bright?

133

MR. LATHAM: Object to the form of the question.

THE WITNESS: Well, I'm not sure I understand that. You know American blend cigarettes in United States use Burley; they require Burley.

BY MR. BROWN: Q. The point is why?

A. Sorry?

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Q. Why? Explain why.
A. Well, because it's an unacceptable taste in the U.S. to have an all flue cured cigarette.
Q. Does RJR screen for radioactive materials in the tobacco leafs?
A. Not routinely, no.
Q. With spot checking or what?
A. A number of years ago we did pretty extensive research trying to determine where certain radioactive materials came from, whether it was root absorption or whether it was atmospheric contamination, so we did extensive research on that. You know, to be complete, we have scraped tobacco after the Chernobyl disaster to make sure that we purchased only tobacco that was free of radiation contamination.
Q. So it was connected to Chernobyl?
A. That's not what I said. What I said was two different things. We've conducted basic research to understand contamination by radioactive elements.

134

Q. All right.
A. And how that happens in a general sense, separate from the Chernobyl issue.
Q. Okay.
A. But then after the Chernobyl disaster, of course, we did a thorough screening of all of our tobacco purchase.
Q. You do the screening? Is there anything you do to reduce the radioisotopes you find in it?
A. Yes.
Q. What?
A. General reduction.
Q. Reduction of tar and nicotine?
A. That's right.
Q. Okay. Is there some reason why Reynolds hasn't used charcoal filters across all of their brands?
A. Yes.
Q. What?
A. Consumer acceptance.
Q. You did have one cigarette with a charcoal filter, did you? I'm not sure.
A. We had -- I think I have already referred to it in this deposition. It was Tempo.
Q. Right.
A. Yes.
Q. And that was a commercial cigarette?

135

A. Yes.
Q. Was that test marketed or just put out there and sold as a commercial brand?
A. I don't know the details about whether there was a test market or not. It was a commercial brand for a long time, sold national.
Q. Not sold anymore?
A. No.
Q. So the only reason you haven't used charcoal filters is acceptance by the consumer?
A. Charcoal cigarettes are not well accepted by the American smokers.
Q. Do you know what the advertising market was, advertising budget was for Tempo?
A. No.
Q. Do you know what it was compared to, say, Camel Lights?

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A. No.
Q. I don't mean dollars, but just would it be accurate to say that the Tempo budget was much smaller than the Camel Lights?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I don't know.
BY MR. BROWN: Q. Okay. Would you agree that advertising and education of consumers as to why you are

136

using charcoal and why it was a good idea might be helpful?
MR. LATHAM: Object to the form of the question, lacks foundation.
THE WITNESS: I think telling consumers the benefits of any technology is helpful. I think that doesn't always overcome consumer acceptance problems, however.
BY MR. BROWN: Q. Do you know if it was attempted to overcome the acceptance in the Tempo case?
A. Well, I think in a general sense -- I don't know about Tempo specifically, but in a general sense, there was quite a lot of press about charcoal filters in the early '60s.
Q. Was that research done for development along with the Tempo charcoal filter?
A. I don't know. I wasn't in the vicinity of that.
Q. When was Tempo compared to when you were there?
A. It was on the market before I came to Reynolds.
Q. Did it stay on after you came there?
A. Yes.
Q. Do you know of any flavor research development that was done with respect to it?
A. I don't know.
Q. Do you know whether or not RJR declined to stay with the charcoal filter because of flavor problems?
A. That's not my understanding. We pulled Tempo out

137

of the market because it wasn't selling.
Q. Well, that may not be inconsistent with what I said. Do you know whether or not there's a decision made that the flavor problems would be too costly to overcome the consumer acceptance?
A. I've never heard that about Tempo. I do know that Tempo wasn't selling; we stopped the market.
Q. Was taste a primary problem with Tempo?
A. The taste of any charcoal filter cigarette is the problem with consumer acceptance. Charcoal filtered cigarettes taste very different than what American smokers are used to. The --
Q. Would you agree generally that the, that whatever RJR has done from 1960 to the present time, it has not reduced lung cancer arising out of smoking of its cigarettes?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I don't know.
BY MR. BROWN: Q. Along that same line, would it be accurate to say that you are not aware of any scientific testing or research at RJR which has demonstrated that anything you have done has caused any significant reduction in lung cancer?
A. I don't know. I do know that we've made great strides in reducing the levels of a variety of constituents in the smoke, and if we as many toxicologists do, believe

138

less ought to be better, then that's a step in the right direction.

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Q. Can you tell me which constituents you have eliminated? Not reduced but eliminated?
A. I didn't say eliminated.
Q. Are any eliminated?
A. The most successful approach so far has been general reduction, excluding the tobacco heating technology for the moment. And in that, none of the constituents are eliminated; they're just greatly reduced.
Q. Okay. Which are the ones that are greatly reduced?
A. All of the constituents.
Q. That's just from the basic logic that if you have less tar and nicotine, you have less constituents. That's the idea?
A. Right, that's the general idea.
Q. Okay. Is there any testing been done to indicate that that has created a safer cigarette?
MR. LATHAM: Object to the form of the question.
THE WITNESS: For tobacco-burning cigarettes?
BY MR. BROWN: Q. Right.
A. There's been quite a lot of testing. I don't know whether at -- you know, I don't know to what extent that may or may not have created safer cigarettes, I don't know. But again, if less ought to be better, is a reasonable goal, then

139

that's, then we've had some success.
Q. Okay, I could kind of wrap that subject up by asking you this: Would you agree that the only basis for RJR to believe that they are creating safer cigarettes is that they have reduced tar and nicotine and therefore they have reduced constituents but there's no testing that demonstrates it?
MR. LATHAM: Object to the form of the question, misstates testimony, lacks foundation.
THE WITNESS: I'm not sure what you mean, there's no testing of that. I mean the market has changed. As we've already talked about, Lights are the most popular, not the high tar cigarettes. Smokers have moved to lower tar cigarettes. I have to believe that that's a step in the right direction. Is it all that's necessary? Look to our tobacco heating, you know, because we didn't believe that that's all that's necessary, and that's why we invested an awful lot of effort and money and frankly devoted a significant proportion of our professional careers to trying to take the next step.
BY MR. BROWN: Q. Okay, I understand all that, but my question to you, which is a key question and which I want you to focus on, is isn't it true there is no testing which supports the idea that your general reduction has been successful in reducing the risk of the RJR cigarette?

140

A. I'm not sure I agree with that.
Q. Testing now, testing.
A. To suggest that -- no testing because you yourself at the very first of this deposition agreed -- in fact, you brought it up, that there's a dose response relationship. If there's a dose response relationship, then less ought to be better.
Q. Okay.
A. And if you go into the laboratory, you can conduct certain times of biological tests which are dose response type tests, and you will see reduced levels of those biological assays. Moreover, if you go and look at, at the epidemiology that's available, it's clear that there's --

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well, the epidemiology shows that there's been a reduction in lung cancer incidence moving from nonfiltered to filtered products. There's some evidence that there may be some reductions among filtered products for lower tar, but that's a little less clear because the full epidemiology is not in front of us, because, you know, the filtered cigarettes, particularly the very low tar cigarettes, haven't been in the market that long.

Q. All right. Well, I understand your dose response contention.

A. I'm sorry. You brought that up.

Q. Well, nobody is going to disagree with you on dose

141

response, but that's not the question I'm asking. I'm asking whether or not you are aware and can tell me about any testing that has been done at RJR that you know about which supports the idea that your general reduction has produced a safe cigarette?

MR. LATHAM: Object to the form of the question, asked and answered. He just --

BY MR. BROWN: Q. I think you said you don't know; is that fair?

A. That's not what I said. I didn't say I didn't know. I will refer you to my last answer because that's exactly what I said, is I answered that question in my last answer.

Q. Well, let's read your answer back, let's see.

A. Okay.

(Whereupon, record read.)

BY MR. BROWN: Q. I think you are missing the point of the question. You are giving me reasons why you believe they're safer, and that's fine, but what I'm asking you to do is this: I'm asking you to identify for me if you can any specific testing that has been done by RJR which supports the idea that cigarettes they're selling are safer, have less risk of creating lung cancer.

A. There are a number of biological assays that clearly show dose response relationships. We've conducted

142

those experiments repeatedly, and you really need to talk with an expert in that area, an expert in biology.

Q. So I take it at this trial you are not going to support the idea that anything RJR has done has been demonstrated by testing to have produced a safer cigarette?

A. It's clear to me that the things that Reynolds has done has been in direct response to the smoke and health issues, and I believe that we've made steps in the right direction. There's been, there's been testing of different types. There is epidemiology that suggests we've been going in the right direction. But to say one tobacco burning cigarette compared to another one is safer, you know, I'm certainly not going to say that one cigarette is definitely safer than another.

Q. Are you going to render the opinion that all or most of the present commercial brands out on the market are safer than they were 20 years ago?

A. Well, I don't think I'm qualified to sit here and say that all cigarettes are definitely safer than cigarettes of 20 years ago. I'm not qualified to say that. I'm telling you that I think we've moved in the right direction. I think that we've done what we can and what we should to address these issues. We're constantly looking at other ways to address these issues, and to bring that to closure, I'll

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point you to the tobacco heating technology.

143

Q. That's the Premiere experiment and I guess the Eclipse too?
A. Premiere and Eclipse.
Q. All right, let's go specifically to Camel Lights and Camel Lights 100. Between 1977 and some later date, within certainly ten years of that, I suppose, those cigarettes have been on the market, and from what I'm hearing is that A, you may have an opinion that they're safer, you may not, I don't know, you can tell us; and B, there is no scientific testing that's been done on those cigarettes which indicate that they are any safer than they were when they first came out?
MR. LATHAM: Object to the form of the question, compound, lacks foundation.
THE WITNESS: I'm sorry, can you rephrase that?
BY MR. BROWN: Q. Do you want it rephrased or repeated?
A. How about dividing it up to into -- you know, piece by piece.
Q. How many pieces?
A. That will help us both; that will help me understand what you are asking and it will help you understand the answer.
Q. All right. Phase one: Do you have an opinion that the Camel Lights and the Camel Light 100s as a result of

144

anything that has been done at RJR are any safer than they were when they first came out?
MR. LATHAM: Object to the form of the question, outside the scope of Dr. Townsend's expertise.
MR. BROWN: Hey, listen. Do you want to stipulate to that?
MR. LATHAM: I will stipulate that he won't be offering any opinions on epidemiology.
MR. BROWN: No, that isn't what you said. You said outside the scope his designation. Now if you are willing to stipulate he will not offer any opinions that those two cigarette brands are any safer than they were when they came out, that's a significant stipulation and that can save us a lot of time if you are willing to do that.
MR. LATHAM: I'll stipulate he doesn't have expertise and won't be offering any opinions about epidemiology or toxicology and applying that to Reynolds cigarette.
MR. BROWN: Okay. Well, that's, that's a start.
THE WITNESS: I can help this.
BY MR. BROWN: Q. But you can answer, sure.
A. I don't know whether it's any safer or not. I don't know.
Q. All right.
A. And I think I have already made it clear that I

145

think we have addressed the issue in the ways that we know how and I think we've been reasonable and responsible.
Q. Okay, second part of that question that you all criticized, fairly perhaps, is this: Is it accurate to say that no RJR in-house testing has addressed the question of whether or not those cigarettes are any safer today, notwithstanding whatever RJR has done, than they were when they were first put on the market?
A. So what you are asking is has testing been done

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comparing the earliest Camel Lights 100 versus today's Camel Lights 100?
Q. Or any way along the line.
A. Okay. To see if there's any differences in --
Q. Safety.
A. Safety?
Q. Uh-huh.
A. I'm not aware of a direct comparison like that.
Q. Okay. And would it be accurate to say that the -- withdraw that, I won't ask that.
Let me ask about carbon monoxide. Are you going to testify about a reduction in carbon monoxide yields from the Camel Lights and Camel Light 100s?
A. Well, I'm going to testify that some of the tools that we've developed for general reduction also reduces carbon monoxide.

146

Q. Are you going to testify that that reduction has arrived at a safe level of carbon monoxide?
A. No.
Q. Okay. Can you tell me what the exposure amounts for carbon monoxide in current RJR brands are compared to say 15 years ago?
A. In a general sense I can, sure.
Q. Okay. Go ahead.
A. Carbon monoxide level in conventional cigarettes is about the same, same level as the tar and in a ventilated, filter ventilated, filtered cigarette, there's about a one to one relationship. So, for a Lights product of about 10 milligrams or 11 milligrams, you will see about the same level of carbon monoxide. For higher tar cigarettes, like a 15, 16, 17 milligram full flavor, you see about a 15, 16, 17 milligram of carbon monoxide.
Q. Are you aware of any government agency regulations, maybe more than one, that concerns itself with the exposure of carbon monoxide to humans? For example, with workers, for example, in terms of air pollution in the EPA?
A. Well, you know, sitting here, I'm not an expert in OSHA regulations or anything of the sort, but I'm pretty confident there are OSHA regulations for workplace exposure for carbon monoxide.
Q. Do you know whether or not either the OSHA or EPA

147

regulations on carbon monoxide content are exceeded by the carbon monoxide yield in the RJR cigarette?
MR. LATHAM: Object to the form of the question, lacks foundation.
THE WITNESS: My answer to your question is that you are talking about apples and oranges because OSHA regulations talk about continuous exposure over the course of, say, an eight-hour day. How many days a week. Again, I'm not expert in the area but it talks about continuous exposure as opposed to exposure from a cigarette which is not continuous. So I don't know the answer to your question.
Q. Do you feel qualified to compare yield to carbon monoxide in RJR cigarettes to OSHA regulations or EPA regulations?
A. Well, my reaction to your question is again I think you are comparing apples and oranges. If you are expecting that I would testify about the comparison there, I think that's unlikely.
Q. Okay. So you may have answered this, and if you have, I apologize. It may have been somewhere in that answer

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you have just given me. But I take it you don't know what the OSHA and IPA regs are with respect to carbon monoxide exposure?
A. That's correct.
Q. Okay. Well, let's talk about ammonia. Does RJR

148

add ammonia to its cigarettes in the manufacturing?
A. There are some cigarettes where we add ammonia or ammonia compounds to some components of the cigarette.
Q. Are the Morris -- sorry. How insulting. Sorry I said that.
A. I am sorry you said that too.
Q. In the Camel Light and the Camel Light 100 is ammonia added?
A. Yes.
Q. Why?
A. Because ammonia and ammonia compounds produce a, or react with sugars and produce flavorable compounds.
Q. So it's for flavor?
A. Yes.
Q. Any other reason?
A. Ammonia is added to some of our reconstituted sheet formations not only for the pyracene formation, the compound formation that we talked about, but also to improve sheet strength of the reconstituted tobacco. So it's used as a processing agent.
Q. Sheet strength, okay. What is the effect of adding the ammonia in terms of freeing up nicotine?
A. What do you mean?
Q. To a gaseous state?
A. At the levels we use in cigarettes, none.

149

Q. Well, I think your answer to the question that I was asking you say at the levels used. Now what you are saying, the amount of ammonia you add does not increase the amount of free nicotine in the cigarette?
A. That's correct.
Q. Okay. Do you add urea to your cigarettes?
A. We have, I believe it's one cigarette style that uses urea.
Q. Does that include the Camel Lights or 100s?
A. Nope.
Q. How about amino acid, do you add that?
A. It may be used in very low levels as top dressing formulation, not in any substantial quantity though.
Q. How big a quantity?
A. Extremely small.
Q. How about the polypeptides, do you add those?
A. Not that I'm aware of.
Q. Do you agree that urea will produce ammonia?
A. Yes.
Q. How about amino acid?
A. It can.
Q. Polypeptides?
A. Possible.
Q. Do you agree that during combustion or pyrolysis those three chemicals will produce additional ammonia?

150

A. It is entirely possible.
Q. Okay. Do you believe there's any release of ammonia into a gaseous state during combustion or pyrolysis in the RJR cigarette?
MR. LATHAM: Object to the form of the question.

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THE WITNESS: I think every burning cigarette has ammonia in the mainstream smoke.
BY MR. BROWN: Q. And that's -- ammonia, free ammonia?
A. Yes. Even cigarettes where you haven't added ammonia in formulating that cigarette, when you analyze the mainstream smoke, you will find ammonia.
Q. Will you find additional nicotine in a gaseous state because of the ammonia?
MR. LATHAM: Object to the form of the question.
THE WITNESS: Are you asking that ammonia, if you add ammonia you get additional, or you get more free nicotine?
BY MR. BROWN: Q. Yeah.
A. You have already asked that and the answer is no.
Q. That's from a standpoint of chemistry that ammonia swept across a tobacco leaf does not create free nicotine; is that what you are saying?
A. At the levels we use in cigarettes, we don't affect free nicotine level.

151

Q. Okay. And so that's a qualified no because you are saying at the levels you use?
A. But that's an important qualifier because that's the level we use. You can hypothetically talk about anything want to.
Q. Sure. And hypothetically, if it was a sufficient quantity, it would free up the nicotine, would that be right?
A. Oh, I think it's entirely possible that if you used extremely high levels of ammonia compounds, you could change the ratio of bound and unbound nicotine. I think that's theoretically entirely possible. At the levels we use, it doesn't happen.
Q. I think you told me this. Would it be accurate to say that RJR has never changed the nicotine to tar ratio in its commercial cigarette?
A. Well, I don't recall saying that. What I said was we did all this work trying to purposely make dramatic changes in the tar to nicotine ratio. We weren't able to do that in a successful commercial product. If you look at today's commercial cigarettes, you will find small differences in the tar to nicotine ratio. That is a result of differences in the construction of the cigarette. More air dilution through more efficient filters will change the tar to nicotine ratio some, but there's a very narrow range within which you get acceptable products.

152

Q. All right, I think we're at the end of this, but let me ask you this. Has there been any biological testing done any of your commercial cigarettes, ever?
A. Yes.
Q. Which ones?
A. A variety of them.
Q. On the Camel Light and 100s?
A. I would say in a general sense, yes.
Q. Who did it?
A. People in our biological and toxicology group.
Q. Are you familiar with any of those tests?
A. Some of them. This is out of my area but I am somewhat familiar.
Q. You are not going to testify to any of the test results or what those tests were; is that correct?
A. I'm not a biologist; I'm not a toxicologist. I'm

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not going to talk about biological and toxicological testing in any detailed sense.
Q. I take it from that you are not even going to suggest that biological testing has been done which supports some of the theory of a safer cigarette, would that be accurate?
A. I think that's overly general. I think I will talk about chemistry reductions. I will talk in a general sense about biology reductions, particularly in the case of Premier

153

and Eclipse.
Q. What do you mean by biology reductions?
A. Reductions in biological assays that have been conducted on Premiere and Eclipse; I will, I will mention that.
Q. Okay.
A. If you are expecting me to go into great detail, I will not because it's not my area.
Q. You are going to testify at least in general about some biology assays which have been done by RJR?
A. By RJR and also others.
Q. What are you going to say about those assays? What did they find? What did they prove?
A. An answer to an earlier question. What we find is that for tobacco heating technology we see dramatically reductions in chemistry, we see dramatic reductions in a number of biological assays.
Q. Is that it, it's restricted to your heating technology?
A. That's going to be the focus on this, sure.
Q. You will not refer to any commercial brand cigarette that's out there now?
A. We've got Eclipse on the market. That is a commercial product.
Q. Well, excluding Eclipse?

154

A. If you exclude tobacco heating technology, I think it's unlikely I'll be speaking about the biology of tobacco burning cigarettes.
Q. Was there any biological testing assays done in the '70s, '80s, up until the time that the Premiere cigarette was being tested?
A. At Reynolds?
Q. Yes.
A. Yes.
Q. And did that demonstrate -- or what did it demonstrate?
A. Well, that's a broad question. We conduct research in all sorts of things.
Q. What was the testing done for?
A. We do, we do biological testing for a variety of reasons to make sure that we don't increase inherent risks through design changes, through the use of other materials or the use of particular materials in cigarettes. We also conduct research on different cigarettes to see what differences we see in biological testing. We also conduct research to try to develop new biological tests. We also work with scientists outside of Reynolds at universities and medical schools to develop new biological tests. I mean this sort of thing has been going on for some time.
Q. Are you aware of any testing that you are going to

155

testify about that compares the Camel Light or 100s to any

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other cigarette in the market, including RJR's other brands?
A. Biological testing?
Q. Right.
A. No.
Q. Are you aware of any clinical studies or epidemiological studies that provide any support for the idea that the Camel Light or Camel 100s have been made any safer than they were when they were first put on the market?
A. I'm not aware of any epidemiological studies that focus on Camel Light or Camel Light 100.
Q. Same with clinical studies?
A. I'm not aware of any such thing.
Q. Okay. All right. Here we go. I notice you had this in your -- you had this in your reliance documents and, I recognize this as some of --
A. Those aren't in my reliance documents. Those are in the documents that were given to me in preparing for this trial.
Q. Oh. So other -- oh, okay. What do you call them then?
MR. LATHAM: These were documents that were called for by your deposition notice.
BY MR. BROWN: Q. Are you going testify to anything concerning this chart that I'm looking at right now?

156

A. It depends on what questions I'm asked.
Q. I think I can probably agree that that's so, although not necessarily with some experts.
A. Some of the subjects that covered in there certainly overlap with part of my testimony, so it depends on what questions I'm asked. I don't know.
Q. Well, let me ask you some questions about it. Turn to the chart that starts off "Key Problem Components."
A. You have got it; I don't.
Q. You won't trust me to read them to you?
A. I'd like to see it, but go ahead.
Q. That sounds fair. There you go.
A. Okay.
Q. Let me see if I have my own version here somewhere. I just might.
You have got that Key Problem Component page up in front of you?
A. Yup.
Q. Okay. The nitrosamines, is that a significant problem component in RJR's cigarettes?
MR. LATHAM: Object to the form of the question.
THE WITNESS: What do you mean, problem component?
BY MR. BROWN: Q. A serious concern in the causation of fatal disease, or at least lung cancer?
A. I think the involvement of nitrosamines in disease

157

is, is a question. It's not clear to me, and in discussions with biologists and toxicologists, it's not clear that if you reduced or completely eliminated nitrosamines that that would necessarily reduce the risk. However, we have developed ways to reduce nitrosamines in flue cured. Tobacco we're conducting work now to reduce it in Burley tobacco, and so we're doing the right thing.
Q. As I understand it, it hasn't been done in commercial brand yet, or has it? Is it a curing process being used?
A. We are using the curing process.
Q. Okay. When did you start?

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A. We started last year commercially.
Q. What's the change in curing process?
A. Going from direct fire to heat exchange.
Q. And that's with respect to all tobacco you use?
A. All flue cured.
Q. All what?
A. All flue cured tobacco is being converted over to heat exchange curing as quickly as possible. We started that commercially last year; we've increased it this year; we'll increase it again next year.
Q. Is there any reason why it wasn't done in the '80s?
A. We didn't know the answer.
Q. To what?

158

A. How to reduce nitrosamines. This was the result of research that was conducted.
Q. But you knew that nitrosamines were a potential high risk component?
A. I don't know what you mean by high risk. In the '80s we nitrosamines were present, we knew there was speculation about whether or not they were carcinogens. The medical information is not conclusive, but nevertheless, we set about ways to reduce or eliminate it, and we've been successful. We're working real hard on Burley now because that's still not complete.
Q. Do you still believe that it's speculation to say that nitrosamines are carcinogenic?
A. I think that there's, there's debate within scientists whether this is, whether the nitrosamines or the role nitrosamines may have in disease; I think there is debate. It's outside my area and I can't enter that debate. My job as a cigarette designer was to reduce or eliminate, and we've done it.
Q. How extensive was the research done in the '80s with regard to reducing or eliminating nitrosamines?
A. Well, I think there was a fair amount of research, not only at Reynolds but other companies and also outside the industry.
Q. Give me some magnitude of dollars spent.

159

A. I can't do that.
Q. How about aldehydes, second item?
A. What about it?
Q. Is it a key problem component?
A. It's certainly one of the -- like nitrosamines, it's one of the constituents that we've looked at. I think aldehydes are important because many of them are irritants. The irritation may be precursors to some types of disease. We've set about to try to reduce aldehydes as much as possible.
Q. When did you start that?
A. A long time ago. In fact, we've already talked about carbon filters. Carbon filters reduce aldehydes. Other types of filter, like ion exchange filters, can reduce aldehydes.
Q. I can't remember, ion exchange filters? Ion?
A. Yes.
Q. Ion exchange filters, are they in commercial use?
A. No, they're not. They have been commercial product in the market.
Q. When did you start the research on the risk of aldehydes, or did you?
MR. LATHAM: Object to the form of the question.

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BY MR. BROWN: Q. Have you ever researched the risks of aldehydes?

160

A. I think there's been quite a lot of research of aldehydes at Reynolds. What I'm familiar with is in the early '60s we quantitated the levels -- or, first of all, we identified a large number of aldehydes that are present; we determined the levels that are present in smoke, and we set about trying to figure out ways to reduce the levels, and one of the key ways that was, that was implemented in the market was carbon filters. Those, of course, over time proved unsuccessful in the market. There was some initial success; it fell away. There's been a lot of other research looking at other ways to reduce aldehydes. That work is going on.
Q. When did the research to reduce aldehydes begin?
A. In the early '60s, I said.
Q. And other than the charcoal filter, has any other method been implemented to reduce aldehydes?
A. Yes, commercially.
Q. Yes.
A. Yes, commercially.
Q. I'm sorry, I don't understand the answer.
A. Commercially, yes, there has been another method implemented.
Q. What is it?
A. Ion exchange resins.
Q. But they're not implemented, are they?
A. They were. They're not in the market any more, but

161

it was commercialized; it was put in the market.
Q. When did they come and go?
A. I would say '78, '79.
Q. And the charcoal? You may have told me, when did they come and go?
A. Early '60s, and it drug on for long time with virtually no market share.
Q. Since the ion exchange filter has gone out, there's been nothing introduced to restrict the amount of, or eliminate aldehydes?
MR. LATHAM: Object to the form of the question.
THE WITNESS: There have not been any new technologies introduced, any new filter technologies I am aware of to reduce aldehydes. That is accomplished in a large way through tobacco heating technology.
BY MR. BROWN: Q. All right. Has RJR done any research into whether or not nitrosamines are carcinogenic?
A. Actually, Reynolds has done fair amount of research looking at nitrosamines, looking at how nitrosamines function in human or in living systems, and in fact, have published papers in the peer review journals on this subject.
Q. Are you going to testify about that research?
A. It's not my area of research.
Q. How about aldehyde, has RJR done any research on the risks that are created by aldehydes?

162

MR. LATHAM: Object to the form of the question.
THE WITNESS: I think there's been some work at Reynolds looking at the importance of aldehydes. I think there's been some work.
BY MR. BROWN: Q. Are you going to testify about that work?
A. It's outside my area.
Q. How about the PAH, polynuclear aromatic

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hydrocarbons, is that a key problem component?
MR. LATHAM: Object to the form of the question.
THE WITNESS: It's like nitrosamines and aldehydes have been considered compounds that need to be reduced or eliminated, no question about it.
BY MR. BROWN: Q. Has anything been implemented that reduces them or eliminates them?
A. Like aldehydes, there have been quite a lot, there's been quite a lot of research to try to reduce or eliminate them. General reduction reduces polynuclear aromatic hydrocarbons --
THE REPORTER: Sorry?
THE WITNESS: PAHs, general reduction reduces PAHs, along with aldehydes, nitrosamines and everything else. We've already talked about that.
BY MR. BROWN: Q. Anything else, any other implemented reduction or elimination program?

163

A. After a lot of research, I'm not aware of any other technology that reduces PAHs, any commercially viable product.
Q. All right. How about carbon monoxide? We talked about that a little bit. I'm not sure we covered this part or not. What specifically if anything has RJR done to reduce or eliminate carbon monoxide?
A. It's a very broad question. We've had extensive research in a number of areas, many projects working on carbon monoxide reduction, looking at designs for low carbon monoxide yields through very different types of filter designs, filter and air dilution designs. We've looked at additives to tobacco to try to reduce carbon monoxide. We've looked at additives in filters to try to reduce carbon monoxide. Some of those have shown some technical success. None of those have been commercially viable, though.
Q. All right. How about nitrous oxide?
A. I would say similar to that, there's been quite a lot of work looking at filter additives for NOx reduction. We've looked at tobacco additives to try to reduce it. We've looked at certain types of tobaccos and processed tobaccos to try to reduce it. We've looked at specialty tobacco or other proprietary tobacco blends to try to reduce it. So there have been a number of things.
Q. Has anything worked?

164

A. Some of the specialty tobacco blends can effect some reduction, yes.
Q. Okay. And have they been used in all of your brands, including Camel Light and Camel 100?
A. Not in all brands and not in Camel Lights.
Q. All right. Now do you agree with the sentence at the bottom of this page which says, "Technology exists to reduce all of these compounds?"
A. I definitely agree with the sentence that technology exists to reduce all of those compounds, and that technology is general reduction by whatever techniques.
Q. And there's no technology you are aware of that would reduce --
A. That can reduce all of those, that's correct.
Q. Okay. How about the next sentence, it says, "In the case of nitrosamines, carbon monoxide and nitrous oxide, they can be virtually eliminated"? I think that refers back to the idea technology exists to virtually eliminate that. Do you agree with that?

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A. No.
Q. You are not aware of any technology that would virtually eliminate it?
A. No.
Q. Filter Technology is the next page I'm looking at.
A. No.

165

Q. If it's in the same order.
A. Okay, I'm there.
Q. We talked about charcoal filters?
A. Right.
Q. What about additional, selective filters for PAH, aldehydes, is that feasible?
A. It's possible to selectively reduce aldehydes, for example, with use of carbon filters; with the use of ion exchange filters to selectively reduce PAHs I think is not possible.
Q. Well, you notice this first says "Use charcoal filters," then we move on and it says, "Use additional, selective filters for PAH." Are you saying that's not possible?
A. No, no, no. Please listen. Look, I am saying it's possible to selectively reduce aldehydes through the use of a number of different types of filters, for example, carbon filters. I used another example, ion exchange resin filters, okay. They can selectively reduce aldehydes. What I did say is I don't believe it's possible to selectively remove PAHs because those things are nonvolatile, and to selectively reduce something in a filter, it's got to have a reasonable volatility to evaporate from the particulate phase, condense on the absorbant or the removal agent, and PAHs are not volatile.

166

Q. I don't think I stated anything different than that, but you are saying selective filters will not work on PAH but they do work on aldehydes?
A. Can, can work.
Q. Do you have any filters in existence in the commercial brands that filter out aldehydes?
A. Not commercial, not selective removal filters, no.
Q. I'm not sure when you add "removal" to that we're talking about the same sentence.
A. Okay, let me make it easy. We don't have commercially today as I speak selective filters for aldehyde removal.
Q. All right. How about increasing the filter length, would that increase the safety of cigarettes?
MR. LATHAM: Object to the form of the question.
THE WITNESS: Well, again, that's one of the tools. That's one of the major tools for general reduction. To the extent that you reduce exposure, you would think that ought to reduce the risk.
BY MR. BROWN: Q. It's kind of general question, but since 1960 -- well, say from 1970 have filter length of any of the brands of RJR been lengthened?
A. Well, some have.
Q. In the Camel Lights or Camel Light 100?
A. Camel Lights, Camel Light 100, I'd say the filter

167

length has not increased.
Q. Filter efficiency is even more general, but this is on this chart, so let me ask it. Do you think that there is a way to increase filter efficiency other than what you have

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done in your commercial cigarettes?
A. What we've done in commercial cigarettes is increase the number of fibers, we've increased the crimp, we've changed the diameter of the fibers, we've changed the cross-sectional dimensions of the fibers all to improve filter efficiencies. Are there other techniques to improve filter efficiency? I think there are, yes.
Q. Okay. When were all of those things you just mentioned done?
A. Well --
Q. When was the last of them completed?
A. Over a period of time beginning in the mid '50s early to mid '50s up until today we continue to work on improving the filter performance.
Q. You listed a bunch of stuff that hopefully I can remember because I didn't write them down. When was the last of them accomplished and implemented into a commercial cigarette?
A. You are looking at it at a discrete time point and I'm telling you there's an evolution, we continue to refine filters. We work closely with our filter supplier to

168

understand filtration mechanisms and continually improve these things. The actual techniques that I just enumerated have been in place for quite some time; we continue to refine the entire package, however.
Q. You say "refine"; you mean improve those techniques?
A. Improve the filter efficiency, characteristics of filters while still trying to maintain reasonable pressure drops so that we can maintain consumer acceptance.
Q. And to what extent if any has there been biological testing as to the effectiveness of filters in terms of safety?
A. I don't understand what you mean there. Because again getting back to what you have admitted, too.
Q. You are sure hung up on my admission of dose response, aren't you?
A. Well --
Q. I'll give you dose response. It's not an argument.
A. Well, good, because I believe dose response is important; we will agree with you on that. And to the extent that you reduce yield of a cigarette, I think that's a step in the right direction. Increased filler efficiency helps accomplish that.
Q. When did you have all of those items that you have mentioned specifically in place subject, of course, to your

169

continual improvement? Was it by the 1970s?
A. I would say yes.
Q. Okay. Now "ventilate at tobacco end of filter." Has that been done an on any RJR cigarette?
A. Not to my knowledge.
Q. Do you think that would increase the safety of the cigarette?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I think it would be very difficult to design low tar cigarettes if you did that.
BY MR. BROWN: Q. Well, why not? Explain that.
A. Well, I think if you ventilated at the tobacco end of the filter, you are reducing your ability, you are reducing your ability to, to design very, very low tar cigarettes because you are essentially eliminating the high

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efficiency, highest efficiency portion of the filter.
Q. I don't understand that. Can you explain it?
A. There's a synergism between the filter ventilation and filter efficiency.
Q. Okay.
A. And by moving the vents, the ventilation to the tobacco rod end of the filter, you are giving up the most efficient portion of the filtering because of that synergy. And I know that's difficult to understand, but trust me.
Q. That's why we're here, we don't trust you.

170

Okay. What is there about moving the ventilation to the end of the filter to your knowledge which would improve the filter or not improve it?
A. Which would improve the filter?
Q. Or not improve it. Are you aware of any improvement to the filter by moving the ventilation holes?
A. As a cigarette designer, that would make it for more difficult to make a very low tar cigarette. I see that as a negative.
Q. If the ventilation holes were blocked by anything, does that eliminate the benefits of ventilation holes?
A. Well, of course. To a degree. It depends how much they're blocked. It depends on whether they're blocked on one puff or all puffs.
Q. Why haven't the holes on filter been marked in some way so that if you look careful you can see where they are?
A. Well, I think on some cigarettes you can clearly see where the ventilation holes are. On other cigarettes, because they use very small perforations, it's very much more difficult, but you can see the hole.
Q. Did I understand correctly that on either the Camel Light or Camel Light 100s there are no ventilation holes in the filter?
A. I don't believe that is correct.
Q. You think the ventilation holes are in both of

171

those brands?
A. I believe so.
Q. Okay. And that's true today?
A. I believe so.
Q. As far as you know, that's never changed?
A. As far as I know, that's never changed.
Q. Would you understand that if there are no ventilation holes today in one of those brands, then there probably never has been?
A. I wouldn't conclude that.
Q. Okay. But you think they are there today? Okay.

Now you have probably heard the word "compensation"?
A. Sure.
Q. Is that a word that is used in the science laboratories at RJR?
A. Sure.
Q. What does it mean?
A. Compensation refers to people changing puffing behavior as a result of some switch in the product they're smoking.
Q. Are you qualified, do you think, as an expert to testify to the effect of compensation on the general reduction of tar and nicotine?
A. Yes.

172

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Q. Okay. And what's your basis of your qualification to do that?
A. As a cigarette designer, I understand how cigarettes work. I also understand many of the, the nuances of alternative puffing behaviors and what that may mean to filter efficiencies, ventilation levels and all the rest of it. I have also actually reviewed quite a lot of information in the literature outside of Reynolds and internal to Reynolds on human smoke behavior and on compensation. I certainly wouldn't position myself in any respect as an expert in compensation, but I think I have sufficient knowledge to speak to it.
Q. Are you going to render an opinion that compensation does not nullify the low tar, low nicotine concept of general reduction?
A. Can you ask me that question a little more simply, please? I got kind of confused in "does not nullify" and all that.
Q. Okay. Let me sneak up on it.
A. Simple would be good.
Q. Simple and sneaky, let's try both. No, let's get it right on the table. I mean you have been saying in this whole deposition that substantially what RJR has done is rely upon a general reduction by which is, simply stated, reduce tar and nicotine, right?

173

A. Among other approaches yes.
Q. Now hypothetically, if the smoker adjusts his or her smoking to that general reduction so that no matter what you do, the amount of nicotine and tar remains the same in terms of that smoker, either by more cigarettes, by deeper inhaling, by longer puffs, would you agree hypothetically the low tar and the low nicotine has been effectively nullified?
MR. LATHAM: Object to form of the question.
THE WITNESS: If a person smokes -- and it was very complicated and long. If a person smokes to get exactly the same tar and nicotine level, then they've defeated the technology of lower tar.
BY MR. BROWN: Q. All right.
A. For that individual.
Q. Now what basis would you have to say or to opine that that doesn't happen?
A. The literature.
Q. All right. Can you cite me to any studies which indicate that compensation is not a factor in nullifying low tar and low nicotine?
A. You know, you are characterizing, you are characterizing my position different than it actually is.
Q. I don't want to do that. Restate it.
A. It's clear to me that compensation can and for some individuals does occur. I think the real question is is

174

compensation complete?
Q. Complete?
A. Complete.
Q. Meaning?
A. Does a person who smokes a low tar cigarette get exactly the same as they do because of compensation as if he -- if they were smoking a high tar cigarette? And I think the bulk of the evidence suggests that compensation does occur for some people. However, compensation overall for smokers as a group is not complete, that smokers of low tar cigarettes still get less in spite of some compensation. Not

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as much less as you would expect based on the FTC smoking method, but you still get less.
Q. When you say not complete, you mean it's not complete until you {KAEUFRPBLGS}?
A. That's what I mean, yes.
Q. So it sounds like you think that in some cases compensation completely nullifies but in other cases in fact you are saying overall you think that it's not a complete nullification?
A. No, no, let me state my opinion once again.
Q. Okay.
A. It's entirely possible for an individual to puff a cigarette in a way such as they can get the same amount of tar and nicotine that they night have gotten from a high tar

175

cigarette. That's entirely possible. If you look at large groups of smokers, you measure their puffing behavior by some means try to estimate is their degree of compensation, what you find is that smokers as a group get less, they don't get as much less as would you predict based on machine smoking, but they still get less. It is clear that compensation does occur for some smokers, but as a group they still get less.
Q. It sounds like you had a particular study or studies in mind when you told me about this group of smokers. Did you?
A. I had have several studies.
Q. Can you cite me to them?
A. Yes.
Q. Okay. What are they?
A. Drs. Pritchard and Robinson published in the peer review literature a study on eight independent studies by scientists outside of the industry.
Q. A megastudy?
A. Sorry?
Q. A megastudy?
A. I don't know what you mean, megastudy.
Q. A review of a lot of literature.
A. What Pritchard and Robinson did was they examined the full compensation literature and gathered all the studies that could be compared and only those studies that were

176

comparable, okay, combined all the data together, and what the evidence shows is that compensation occurs. It's not complete; it's probably somewhere in the middle between no compensation and full compensation, and that was, that was published in a peer review journal.
Q. Can you give me the cite?
A. I think it's in the Journal of Psychopharmacology, if I'm not mistaken.
Q. Do you know what year?
A. I'll have to look it up for you.

There are two other studies from Reynolds where we actually did experiments with humans, not in switching studies but in as subjects smoking their usual brand across the tar range, and those studies -- and it's interesting because the first study showed very little compensation and those of us at Reynolds weren't too sure about that result; we went out and did another study that showed a high level of compensation. So we have two Reynolds studies. One shows high level compensation, one shows a very low compensation. We have the Pritchard and Robinson analysis of a number of independent studies that shows somewhere in the middle, and I think the truth is probably somewhere in the middle. I think

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it also points out the difficulty of doing these kinds of experiments.
Q. Who did the studies for RJR?

177

A. A fellow named Dr. bird.
Q. And were you part of that study?
A. No, I wasn't part of the study. I reviewed it.
Q. I mean were you involved in the study?
A. No, I wasn't directly. I did review some of the data because I was interested in it. One of the studies has already been published; the second one is submitted for publication in peer review journal.
Q. And did you bring copies of that with you?
A. I didn't know we were going to talk about it today.
Q. You are not going to rely on it?
MR. LATHAM: Object to the form of the question.
BY MR. BROWN: Q. Well --
A. I'll be happy to speak to them because I'm familiar with them.
Q. Are you going to render an opinion along the lines you just told me about compensation?
A. I think if I am asked question about compensation I will tell what I believe and what I know, which is what we've just talked about.
Q. Will the RJR lawyers ask you about that?
A. I don't know.
Q. And are you being presented to give that opinion among other things?
A. I don't know whether I'll be asked a question about

178

that or not. I just simply don't know.
Q. Don't you have a list of the opinions you are going to be asked for by the RJR lawyers?
A. You know, the RJR lawyers know what my competency is, they know what areas that I am willing to render opinions on. They know if asked about compensation, you know, I am a scientist; I will tell you the court whoever what I believe.
MR. LATHAM: I'll short-cut this. The documents he's referred to are all on your exhibit list.
MR. BROWN: That ought to be easy to find. If I just go through 3,000 documents between by now and Monday, it will come right up.
MR. LATHAM: We identified them for you before this deposition.
MR. BROWN: But most -- those studies are on the exhibit lists?
MR. LATHAM: All three of them.
MR. BROWN: But are you giving us a heads up tomorrow or whatever, what the numbers are? Do you know the numbers?
MR. KREINER: They're in the letter sent a couple of days ago.
MR. LATHAM: Every document --
MR. BROWN: I may not have seen it.
MR. LATHAM: Well, give this back; it's got some

179

handwriting on it.
MR. BROWN: It's got the number?
MR. LATHAM: Yes, it's got the number, the ranges of numbers.
MR. BROWN: Oh, okay.
MR. LATHAM: It's not 3000; it's probably 300.
MR. BROWN: I hope Martha is not using this for

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what I think she is. Anyway, could you fax it to me to my attention?

MR. KREINER: I can, I will.

MR. BROWN: It will sure be appreciated because I don't have it.

Q. Anyway, it sounds like you might be asked about this stuff, so why don't you give me a general idea of these studies. Were they both comparable in terms of people and methodology, number of people?

A. The studies that Pritchard and Robinson --

Q. No, I'm talking about RJR, the RJR two studies.

A. You are talking about the two Bird studies? Okay, the two Bird studies, I have already said, were people smoking their usual brands. They were not switching studies, so they were long-term smokers of those particular brands. They span the category from ultra light to high tar or full flavor product. Bird recommended better methodology for measuring nicotine metabolites in urine extensive analyses of

180

these people over time to try to estimate their nicotine intake.

Q. Okay.

A. And in one study he found a -- in the first study he found a very large difference in nicotine intake going from high tar smokers to very low tar smokers.

Q. All right.

A. The second study he found a reduction in the nicotine intake across the full range, but the reduction wasn't nearly as great as in the first study.

Q. How many people were involved?

A. The first study was small; I think it had 13 or 18 people, I can't recall. The second study, we target, tried to target 100 smokers, and I think maybe 88 or 90 or something like that actually completed the study. Taken together, I think it does point out that this is a very difficult experiment to do, and if you put it together with the multiple studies that Bird, that Robinson and Pritchard put together and analyzed, I think it's very clear to me that the truth is somewhere probably in the middle. Compensation occurs, of course it occurs, but it's not complete. It may be for some individual smokers, but for smokers as a group, I don't believe it's complete.

Q. So would you agree that it would just be, based on the evidence, it would just be hard to say what the effect of

181

compensation would be on any one or few individuals?

A. Oh, I don't think you can say what compensation -- whether any particular individual compensates fully, compensates a little bit or maybe even doesn't compensate at all. It's hard to imagine. Unless you went in and actually did experiments with that individual, I don't think one could draw a conclusion.

Q. Okay. Tobacco Processing is the name of the next sheet. Okay. Do you agree that through tobacco processing you can extract all alkaloids?

A. Right now, I'm on the right page.

Q. Want me to go through that section a little at a time? Do you agree that you can extract alkaloids in your tobacco processing?

A. I think it's possible to develop a process that extracts essentially all the alkaloids.

Q. How about removing the TSNA, the tobacco specific TSNA.

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A. It's probably possible to develop a process that would remove TSNAs from tobacco.
Q. How about nitrates?
A. I think it's possible to probably effect a major reduction in the nitrate level. I don't know if it's possible to extract it all.
Q. How about reintroduction of purified nicotine, can you do that?

182

A. That's possible.
Q. You have been saying "possible." First of all, RJR hasn't done any of those, they've done some of them, what?
A. We've never developed a process to extract all alkaloids. We've never developed a process to remove TSNAs, although you are aware that we've developed a different approach for TSNA reduction?
Q. That's the curing process?
A. Right, which is the far more practical. We don't have a process that will affect major reduction in nitrates in tobacco and we've not reintroduced purified nicotine.
Q. Refresh my memory in case you hadn't told me before, the curing process to remove TSNA, that was just started a year ago or --
A. That's not what I said.
Q. What did you say?
A. We've conducted research for a number of years.
Q. Right?
A. We've made the discovery. Last year we actually began commercializing it.
Q. That's what I meant. Okay, so commercially that was started last year, okay. Why haven't you done others, the ones you haven't done?
A. Well, if we extract all the alkaloids, it's not clear to me as a cigarette designer you are going to have a consumer acceptable product, because we've already said that nicotine is important to overall acceptance of cigarette. Nicotine is an alkaloid. I told you, we've talked about TSNA.

183

Q. Right.
A. As far as nitrates, as you know, there are some ways to reduce nitrates. I am not sure tobacco processing is the best way to do that, and we talked a little bit about specialty blends with reduced nitrate. I think that may be a far more practical approach. And I don't think in commercial products we've ever reintroduced purified nicotine.
Q. Why haven't you reduced nitrates through specialty blends or any other way?
A. What?
Q. Why haven't you implemented reduction of nitrates through any method, whether it's selection of strains, whatever?
A. We've developed some approaches for nitrate reduction and we're still working on that.
Q. Okay, I think you have told me that Burley tobacco is not feasible because of customer acceptance, right?
A. What --
MR. LATHAM: Object to the form of the question.
THE WITNESS: You asked me a different question.

184

You were talking about eliminating Burley.
BY MR. BROWN: Q. Reduced here.
A. What it says here, reduce the use. Two different

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things.
Q. Could you do that?
A. It's possible to reduce the use of Burley tobacco to a degree.
Q. Wouldn't it make a cigarette safer?
MR. LATHAM: Object to form.
THE WITNESS: I don't believe so.
BY MR. BROWN: Q. But you could do it?
A. It's possible to reduce the use of Burley tobacco to a degree and probably not suffer too much on consumer acceptance.
Q. Okay.
A. If your question is would that make a safer cigarette, I don't believe so.
Q. Well, let's look at the next one, eliminate use of additives, especially those containing nitrogen. Is that feasible?
A. Well, if the question is eliminate use of additives, we've done that in one of our brands. That's commercially feasible. It's in one of our major brands.
Q. Is that Premiere?
A. Winston.

185

Q. Winston? All right. So you can do it. And that especially you got rid of additives which contain nitrogen?
A. We got rid of all additives, all tobacco additives.
Q. Okay. Why haven't you done that in all your brands?
A. Some people prefer the taste of cigarettes that have additives.
Q. How about using more expanded tobacco, would you agree, first of all, expanded tobacco is safer?
MR. LATHAM: Object to the form of the question.
THE WITNESS: We've been through this over and over. To the degree you reduce tar level, that may present less risk. I am not about to say that a low tar cigarette is definitely safer. I don't think there is a safe cigarette. We've already talked about that.
BY MR. BROWN: Q. I think you have told me you don't think could you use any more expanded tobacco than you are using?
A. I didn't say that.
Q. Okay. Could you use more?
A. Technically it's possible. Maintain consumer acceptance? I don't think so. I mean we use a lot of expanded tobacco in our products. If we go up, if we go to high levels of expanded tobacco, consumer acceptance suffers.
Q. What about the last one, it says decrease additives

186

and sizing on reconstituted tobacco or eliminate it. Is that possible?
A. From a technical point of view?
Q. Yes.
A. It's feasible.
Q. But you haven't done it?
A. No.
Q. Why not?
A. Well, because reconstituted tobacco is important in today's blends, not only for taste but for tar reduction. And in some of the reconstituted tobacco, we do use additives such as ammonia or ammonia compounds, which improves taste characteristics.
Q. All right. I think we've pretty much covered

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everything on that. The next one, Tobacco Technology. Product Testing, let's first look at the first one.
A. Where are you?
Q. Product Testing. The first one says "Test all brands as marketed in a batter of in vivo and in vitro tests and publish the results." Is there any reason why you couldn't do that?
A. We do some testing on a variety of products using both in vitro and in vivo tests. And in fact, we've -- you know, we're publishing some of the results of the benchmarking study that include Ames results, for example.

187

Q. Are you only aware of one Ames published study? Is there only one that was published?
MR. LATHAM: Object to the form of the question. Published by whom, studied what?
BY MR. BROWN: Q. The study we're talking about that was marked in evidence but --
A. The one you couldn't show me so we couldn't talk about it?
Q. Yeah, it's in the courtroom.
A. I don't know what you are talking about.
Q. Do you know who conducted or who the authors were of the published study?
MR. LATHAM: What published study?
THE WITNESS: I don't know what study you are talking about.
BY MR. BROWN: Q. Are you going to talk about a published study that did the same testing?
A. I'm a chemist.
Q. So you are not going to?
A. I don't intend to.
Q. All right, let's get to your documents that are right in front of you, which is the notice and specifically Exhibit A. I want to ask you whether those documents exist, and tell me whether they do or not. First I'd ask you if there's any particular reason why you didn't bring any of

188

these, or maybe you did.
MR. LATHAM: Let me interject here, Mr. Brown.
MR. BROWN: Is there something here that's called for that you --
MR. LATHAM: All documents that Dr. Townsend is going to rely on for his opinions in this case have been provided to you previously and are identified specifically on a letter to Ms. Berman. Dr. Townsend will not be relying on any documents that we're aware of today that aren't already on his exhibit list --
MR. BROWN: Okay, so --
MR. LATHAM: -- and the list that Mr. Kreiner wrote to Martha Berman yesterday.
BY MR. BROWN: Q. So you are not going to rely upon any documents which are contained in -- let's go through them fast, if that's the situation. Paragraph one?
MR. LATHAM: That's -- no, what I said, Mr. Brown, is all documents that he's going to rely on have been identified to you. These categories that you list we have objected to as improper request for production. We don't believe that Dr. Townsend is provided to peruse every document in Reynold's file that relates to research and development. That's overbroad and burdensome. We narrowed that and provided a list of documents that he does rely on, and you have those.

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MR. BROWN: That's in the letter you sent to Martha Berman?

MR. LATHAM: Dr. Townsend is prepared to answer as to whether or not there's documents on his reliance list because he constructed it, developed it in response to these categories, and I suspect he could answer that question. But did he bring any? No, he didn't because he had already provided them to us previously.

MR. BROWN: He already did what?

MR. LATHAM: Provided them to us previously.

THE WITNESS: The reliance documents.

MR. BROWN: To you?

MR. LATHAM: To people that work in my law firm, that is right.

MR. BROWN: And we haven't been provided them?

MR. LATHAM: You have. You have them; they're identified on this list.

MR. BROWN: They're identified but they're not provided?

MR. LATHAM: You are. You have them; they're exhibits.

MR. BROWN: Okay. I'm not looking at the letter so I can't read your mind.

MR. LATHAM: Read the next paragraph and tell me if you even want to go through this. I don't think it's

necessary.

MR. 1234: So he's going to rely upon all those documents.

MR. LATHAM: He may.

MR. BROWN: Are you saying that every one of these documents requested is satisfied by this letter?

MR. LATHAM: No. I'm saying every document that he's going to rely on for his opinions in this case are satisfied in that letter. Dr. Townsend also relies on his 25 years of experience -- well, 22 in cigarette designing, and his work at Reynolds. So, to the extent he knows of other information that's not in those documents, he can rely on that, of course, too.

BY MR. BROWN: Q. Well, then, let me ask you this, Doctor. We'll cut right through this. I don't know if you know what these exhibits are; I'm sure I don't, but you look at this Exhibit A. Is there anything which is not contained in those exhibits which he is in fact going to rely on?

MR. LATHAM: You will have to ask him each of those questions then. He knows what his reliance list is; he can answer that question based on that.

BY MR. BROWN: Q. Okay. Well, why don't you just go through there and just look, just read it to yourself and if you come to a number that says yes, you are going to rely upon those kinds of documents, you can tell me.

Dr. Townsend, let me point out to you the qualifier right at the top of Exhibit A which means every one of these 22 listed documents you were requested to bring were qualified by the, that you read or reviewed or relied upon with respect to. So we didn't ask for all of the documents that RJR had regarding your historical and current activities but only those you did what the qualifier said.

MR. LATHAM: Let me interject. You asked for every document he's ever read, Mr. Brown; that's plainly overbroad. How can he possibly collect every document he's ever read?

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MR. BROWN: I see your point. You know, that may have been a tad overbroad.
MR. LATHAM: So what we did -- that's a good start -- we provided his reliance documents, let's characterize them that way.
BY MR. BROWN: Q. All right, let's just talk about "relied on." Let's just qualify it by "relied on." Marching down through the numbers to yourself, do you find anything there that would qualify?
A. There are documents that speak to No. 1, No. 2 certainly, No. 3, No. 4, No. 5, No. 6.
Q. You brought us a few. The ones you brought were the ones you are going to rely on?
A. No, I'm not really relying on those. Those are specifically documents that I've reviewed for this case. I'm

192

not going to rely on those documents.
Q. All right.
A. They're not my documents.
Q. Okay, so not No. 7.
A. So I don't think there's any on No. 7. I don't think so on No. 8, certainly not on 9. There's none for No. 10. I think there's documents on 11, there's a document on No. 12, I believe.
Q. Any on 13?
A. Yeah, I think that Premiere monograph is part of my reliance documents that speaks to that. I don't think there's any on No. 14. I don't think so for 15. I don't understand the term "whole product testing." I don't think so.
Q. Where was that, in 16?
A. 16, I think the answer is no.
Q. Well, before you go ahead let me ask some more questions about that. Whole product testing refers to safety or health testing regarding cigarettes as a whole as opposed to component parts of it. For example, testing an additive, testing a constituent part?
A. I don't understand the distinction because at Reynolds we test finished cigarettes. No, it's not a question of components versus finished cigarettes because that's what we do.

193

Q. Look at the rest of it, for safety and health, whole product testing for safety and health?
A. The answer is no.
Q. Okay.
A. Yes, 17 yes; 18 yes; 19, I don't think so; 20 yes; 21 yes; 22 yes.
So what I've said yes to, I believe that there are documents in my reliance materials that in fact speak to those.
Q. And are you telling me that as far as you can tell, that's all in the exhibits you have referred to in this letter?
MR. LATHAM: I will confirm that Dr. Townsend's reliance list which has been reviewed by him is what we have identified in the exhibit list.
MR. BROWN: Okay. Do you have a copy of this I can take with me? Or maybe can you just fax it to me or maybe you already have; I don't know.
Q. Okay, let's go to the designation of expert routine here. Do you have a copy of it that you can have him look at?

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A. Nope.
MR. KREINER: Here.
Can we go off the record?
(Whereupon, discussion held off the record.)

194

BY MR. BROWN: Q. Okay, your designation of yourself as an expert, I don't know, are you familiar with the California designation procedure? You are probably not.
A. I'm not familiar with California.
Q. Well, it's a good place to be familiar with but --
A. It seems like a nice place.
Q. Not as humid as where you live. Dr. Phillips expects --
MR. LATHAM: Nope, Townsend.
BY MR. BROWN: Q. I'm sorry, wrong place. I thought I had it and then I don't. You mean you are not Dr. Phillips? Good heavens, I'm going have to start over.
A. Wrong witness.
Q. Dr. Townsend is expected to offer expert opinion testimony in the following areas, that's -- I'm reading from your designation -- one, the historical and current activities of Reynolds research and development department. Well, that's a pretty broad subject. Do you believe there's any opinions areas you are going to be addressing in your direct examination which are not what we've discussed here today in this deposition?
A. I think we've covered a lot of it by covering the main areas of focus on this effort.
Q. Well, just a very general way, what are the historical and current activities which you are going to make

195

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reference to?
A. Centering primarily on cigarette design research or understanding of cigarettes and how they work and how design changes can reduce or eliminate certain constituents either selectively or in general, we talk about the design, the new designs of tobacco heating, we talk about TN ratios, probably talk about ammonia and other design considerations and historical research that's been conducted and research that continues today. That's some of them.
Q. Would certain of -- I guess that I've pretty much covered that, do you think there's --
A. You have pretty much covered it.
Q. Okay. TM, ammonia. You said ammonia. What are you going to say about ammonia?
A. We've already covered some of that. You have asked questions about the effect of ammonia on nicotine.
Q. What do you need to add? Pretty much covered it?
A. Pretty much.
Q. Okay, let's go to No. 2, the state of the art in cigarette design including the techniques employed by Reynolds since the 1950s to reduce tar and nicotine yields, that is filtration, reconstituted tobacco, expanded tobacco and ventilation.
Well, let me ask a couple of questions about that. Let me ask you to do this in a very brief way. The

196

techniques, can you list for me the techniques employed by Reynolds since the 1950s to reduce tar and nicotine yields which have in fact been implemented in RJR cigarettes? I think the answer is fairly brief. What is it?
A. We've already covered most of them. The use of

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filters, air dilution, faster burning papers, more porous papers, expanded tobacco, reconstituted tobacco, smaller circumference, lower tobacco weight. Those are the main ones.
Q. All right. And does general reduction cover all of those?
A. Those are all elements of general reduction.
Q. Okay, all right. Three, theories and recommendations of the public health community regarding cigarette design including Reynolds' efforts to respond thereto. No, that we haven't covered. So, as I understand that, the public health community has recommended some cigarette designs and RJR has responded to those recommendations?
A. No, that's not quite right. The public health community hasn't recommended any cigarette designs. To the contrary, they have recommended things that they think ought to be done to smoke in particular, and in fact, we've talked about one as an example, the call for reduced TSNAs. And there are some scientists out there who believe that TSNAs

197

are a serious problem and have called for the reduction of it.
Q. Okay.
A. So it's that interaction with the scientific, outside scientific community, with the public health community, with the medical community in looking at the various theories, whether it's TSNN, benzapyrene, aldehydes or whatever, and then taking that into cigarette design research to see how to accomplish that. That's the kind of interaction we are talking about.
Q. Is there any -- I say positive reaction in the sense only that recommendations were made and you attempted to do them, that's what I mean by positive. Are there any RJR positive reactions to suggestions by the health community other than the various elements of general reduction?
MR. LATHAM: Object to the form of the question, vague.
BY MR. BROWN: Q. Well, what you have covered.
A. I wouldn't limit it just to general reduction; I would certainly include any techniques for reducing or eliminating compounds or constituents in smoke that may be a problem.
Q. Well, as I understand it, other than general reduction, there's none been implemented?
A. That's not true. We've talked about Premiere;

198

we've talked about Eclipse.
Q. Okay. General reduction, Premiere, Eclipse.
A. How about reduced TSNAs?
Q. Isn't that from general reductions?
A. No, that's from curing changes.
Q. Oh. So from curing. It's getting late. Curing changes. And that's the TSNA part. TSNA would be part of the general reduction, though, right?
A. TSNAs are reduced by general reduction but in addition to that we found a way to --
Q. I got you. Okay, any others besides general reductions, Premiere and Eclipse cigarettes and curing changes which are aimed at the TSNAs?
A. I think those are the main ones.
Q. Okay. No other suggestions by public health authorities that you have responded to in some way?

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MR. LATHAM: Object to the form of the question as overbroad.
THE WITNESS: There are many, there are many suggestions from the scientific and public health community to do certain things, you know, and we've talked about some of them.
BY MR. BROWN: Q. Okay. I'm getting punchy, but these are the reactions to those, whatever they might be?
A. I think those are the main ones, the main

199

responses, sure.
Q. All right. No. 4, the research efforts by Reynolds to develop cigarettes with the potential to reduce the risks associated with smoking, including Reynolds' efforts to develop a market for tobacco heating cigarettes.
Let me ask this about it. These four you just gave me, would eliminating the last thing here, develop a market for tobacco heating cigarettes, do these four items, general reductions, the development of the Premiere and Eclipse cigarettes and curing changes, for TSNA, do they represent all of the research efforts by Reynolds to reduce the potential of risks?
A. General reduction, selective reduction, TSNA reduction, the tobacco heating and even our work on altered TN ratio were all efforts aimed at reducing the risk of smoking.
Q. Okay, but I guess I should have qualified it further. Would these four general reductions, Premiere, Eclipse and the curing changes, would they represent all of the implemented methodology to do that, or can you add specific reductions to that too?
A. Well, I would add specific reductions because there are some specific reductions that have been achieved.
Q. Selective specific, same thing?
A. Yeah, selective reduction.

200

Q. So we've discussed that?
A. And the TM ratio change hasn't been implemented so --
Q. Okay, let me just get a handle on that. Not implemented the TMN ratio. Is there anything else significant that you have researched but you didn't implement?
MR. LATHAM: Object to the form of question as overbroad.
THE WITNESS: It's quite a lot that's been looked at. I've tried to just lump them into nice big categories for you. I think that covered most of it.
BY MR. BROWN: Q. Okay, you think you have pretty much -- okay. All right. Issues relating to cigarette smoke pH and the role of ammonia and ammonia compounds in Reynolds cigarette manufacturing. What are the issues relating to smoke pH and the role of ammonia, or is that two different subjects?
A. No, I think they're very related.
Q. So relate them for me and tell me what you are talking about there.
A. Essentially responding to the theories and criticisms of use of ammonia in cigarettes, such as some of the questions you have already asked me.
Q. You do it except for flavoring, you told me, and it

201

doesn't free up nicotine anyway, that a sense?

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A. Don't try to simplify it. That's a very complex subject.
Q. But you are going to give that opinion, though?
A. I'm going to use, give the opinion we use ammonia in cigarettes primarily for improving the flavor characteristic. It does secondarily improve sheet strength in reconstituted, when it's used in reconstituted tobacco, and I will give the opinion that it doesn't change pH, it doesn't change free nicotine at the levels we use, but it does give those taste benefits.
Q. All right. And that's the scope of your opinion?
A. It depends on how much somebody wants to dig into the details of this very complex issue.
Q. All right. What do you say about No. 6, FTC standardized smoking method?
A. Depends what questions are asked. I'll certainly represent what this FTC standard test method represents. I can represent -- or I can talk about some of the criticisms of that method, some of the alternative proposals that have been put on the table and address those, and it depends on what questions are asked.
Q. In your opinion is the FTC standardized smoke method -- that's, I guess we're talking about the machine smoke test, right, or analyzing of smoke?

A. That is one machine method.
Q. Okay.
A. It happens to be the standard method in the U.S.
Q. What do you think the criticisms are?
A. Well, I think that the main criticism is the FTC smoking method doesn't represent the puffing behavior that humans use.
Q. And the result of that is what, according to its criticism?
A. The results of that is smokers get more tar and more nicotine than the --
Q. Than the --
A. -- than the FTC test method suggests.
Q. Okay. Do you agree with that?
A. In a general sense I think that's true.
Q. Okay. And so what are you going to say beyond that?
A. It depends what questions are asked.
Q. Is RJR in favor of keeping that method?
A. I think the FTC smoking method provides a basis for comparison to consumers. I don't think it was ever intended to represent what humans actually get.
Q. All right. I'm going to go through those rapidly and see if there's anything I am going to ask you about. Do you want to pick up the -- let's see, I guess these have been numbered without numbering ours. That's a problem.

MR. LATHAM: Why don't you just use the ones that are marked, Bob?
MR. BROWN: There you go.
Q. This No. 4B, it's got an RJR low line on it and it's also an RJR high. I don't understand that as much as I would like to. Are you just saying that's the range of your brand?
A. That's the range of the brands. The RJR low line is the lowest product we sell at a given date; the high is the highest product we sell at a given date.
Q. Okay. Charcoal Filters Fail in the Marketplace, 4C

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and this just a graph showing the declining sales of Lark and Tempo; is that the idea?
A. Well, in a general sense, this depicts the rapid rise of carbon filtered cigarettes and the fairly rapid decline.
Q. Are you going to say anything about sidestream smoke?
A. It depends if I'm asked a question. I don't know.
Q. Does a smoker inhale sidestream smoke?
A. Well, I think that's possible, sure.
Q. You told me this before, but I have forgotten. What's TPM?
A. Total particulate material.

204

Q. Thank you. And this chart, 4G, shows a steady increase in the ability or in the actual identification of constituents; is that the idea?
A. Right.
Q. And it indicates that there are 6000 potential constituents and you are at somewhere like 5000 at this point. At least you were there.
A. I don't think that implies that at all.
Q. Well, does it give you any indication of what percentage of number of constituents have been identified?
MR. LATHAM: Object to the form of the question, asked and answered. You went through this before.
THE WITNESS: No, no.
MR. BROWN: I asked him about the chart.
Q. How many constituents are there?
A. Known?
Q. Well, by 1990 there were 4,800 identified, according to this chart.
A. Right.
Q. I guess if we don't know about them, you don't know how to count them. Would that be right?
A. It seems right to me.
Q. Okay. If I remember correctly, you have told me that the technique explored to reduce BaP, which is 4H, none of those have been implemented?

205

A. That's correct.
Q. Table 26 comes out of Surgeon General's Report, and let's see what opinions are you going to be giving based on this chart?
A. We will use this chart to point out that the use of solvent extraction for bena-a-pyrene reduction was not practical and that using certain tobacco additives, like nitrates, in particular magnesium nitrate and the like also were not, were not the direction to go because the Surgeon General indicated they were of academic interest only.
Q. Okay. Significant problems with selective reduction, which is 4J, technical difficulty you have explained. What do you mean by "moving target experience"?
A. The scientific community, at least some members of the scientific community kept proposing different theories and in fact moving the target, the compounds of concern.
Q. Okay.
A. One of the first was benz-a-pyrene, then -- well, maybe benz-a-pyrene by itself is not the problem, so no, it's on to the aldehyde and on to nitrosamine, on to whatever.
Q. Did RJR recognize it had an obligation to figure out what would be safer and to do it?
MR. LATHAM: Object to the form of the question,

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calls for legal conclusion.
BY MR. BROWN: Q. Or were you just reacting to

206

whatever was suggested?
MR. LATHAM: Same objection.
THE WITNESS: You know, that's overly simplistic. We've looked to the scientific community for all the theories that the scientific community has proposed; we've had some of our own even.
BY MR. BROWN: Q. That's what I'm asking.
A. Always we go to the lab and we try to figure out what we can do with cigarette design to reduce or eliminate those compounds. That's been our goal.
Q. What research has not been suggested by the health community?
A. In terms of specific compounds?
Q. Well, I mean in terms of anything that would make the cigarette safer?
A. How about tobacco heating technology? I mean that's, that's an approach that was not suggested by anyone outside of Reynolds.
Q. Okay.
A. We developed it. We saw, you know, for a variety of reasons this was a major -- this could be a major step forward.
Q. All right. Any others?
A. Well, I think that's probably the most notable one.
Q. All right, but can you think of any others as you

207

sit here now?
A. Not as I sit here now.
Q. Strangers and intended consequences. Strangers and unintended consequences about the chemistry of burning and what additions to the additives might cause; is that the idea?
A. Well, strangers is pretty simple; it's adding something to a cigarette that's not already present. Our job is to make the chemistry simpler, not increase the complexity. So, for example, adding palladium chloride to tobacco would be adding a stranger to the cigarette.
Q. Why is taste a significant problem with selective reduction?
A. Because many of the ways that we've looked to effect a selective reduction really dramatically upset the taste characteristic.
Q. Therefore upset consumer acceptance?
A. Absolutely. A notable example is the use of carbon filters.
Q. Is taste research a particularly high percentage of your research budget?
A. It's very important in our research effort. It's hard for me to estimate the relative proportions of dollars spent on it.
Q. Would it be fair to say you spend more in research

208

of taste than any other aspect of your research?
A. I don't think that's even a fair question because the kind of research that goes into flavor research or taste research, as you call it, is mostly laboratory work, which leads up to then some kind of taste evaluations. Those types of experiments are relatively cheap compared to, say, building a pilot plant.
Q. Building a what?

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A. A pilot plant to accomplish a specific testing or a specific type of process. So comparing dollars is not the right question. The right question is, is it important in our research effort? The answer is absolutely.
Q. Would it be accurate to say that taste or flavor conclusions is really the engine that drives all of your designs, cigarette design?
MR. LATHAM: Object to the form of the question.
THE WITNESS: That's not true at all.
BY MR. BROWN: Q. Well, let me put it this way. If an idea in cigarette design fails the taste test, you don't do it?
A. That's not true at all.
Q. Well, what idea in cigarette design have you implemented where it in fact failed to demonstrate it did have the proper taste or flavor?
A. Premiere.

209

Q. Any other?
A. Eclipse.
Q. Any other?
A. We've had some other cigarettes on the market that are in the test market that have scored deficient compared some control.
Q. But I assume that those test markets were not tried until someone at least thought there was a reasonable possibility that they would, they would be successful? I mean you didn't put them out there knowing there was going to be a serious taste problem or taste failure, I should say?
A. With Premiere we knew there was a serious taste issue, no question about it. We decided to market it anyway and learn from the test market.
Q. Okay. Advantages of General Reduction, 4K, let's see. I think we've covered them pretty much except the last one. I just might ask a question, does not change the character of the taste. Tar and nicotine reduction does not change the character of taste?
A. It changes the intensity of the taste response but it doesn't change the character per se because you are reducing all the compounds more or less to the same degree, so you are not really upsetting the balance of taste, unlike selective reduction.
Q. But I'm not quite sure I understand you. A general

210

reduction might have a flavor or taste problem?
A. It has, it has an intensity, taste intensity problem. It's like going from a regular coke down to a watered down coke but the taste characteristics are very, very similar; it's just the intensity is less.
Q. Okay. Does your general reduction technique, Exhibit 4L, set forth all of the reduction techniques which you have used?
A. Those are the major ones, and those are the ones I'll be talking about in trial.
Q. Okay. Methods of filtration. Does that deal generically with all filters or were you talking about some specific filter?
A. That chart will be used to discuss the mechanism of filtration. It is general to any kind of fibrous filtration of smoking particles.
Q. Inertial impaction, what's that?
A. Inertial impaction is when the smoke particle actually collides with the leading edge of the fiber by

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virtue of its momentum.
Q. Diffusional deposition?
A. Kind of like what we're doing here.
Q. Yeah.
A. Diffusional deposition is --
Q. At least it's not delusional.

211

A. Sometimes it's diffuse. Diffusional deposition is mechanism of particle capture where the particle actually travels around the fiber, the filter fiber, but then diffuses into the side via brownian diffusion.
Q. What's that, a chemical rule? At least some guy named Browning?
A. I'm sorry?
Q. What is that you just mentioned?
A. Brownian diffusion is random diffusion of small particles and molecule and atoms.
Q. What's the impact of that event, does it work right or it doesn't work?
A. When the particle diffuses into the side of the fiber, it stick and it removes the particle from the smoke stream.
Q. Is that what the filter's all about?
A. That's what the filter is all about.
Q. What's the difference between interception?
A. Interception is when the particles traveling around the fiber at a distance are close enough so that it actually touches when it goes around, and when it touches, it sticks, so it's a mechanism for particle removal.
Q. So they both are ways of describing when the filter works?
A. All three of them.

212

Q. So the initial impact is where you hit and sticking right there too, huh?
Okay, what's the difference between interception and deposition? I guess diffusional, they way it's diagrammed, it doesn't look any different. They both have some description of how they stick on the side of the filter.
A. Diffusional deposition is when the particle diffuses to the surface of fiber; inertial impaction is it is moving with sufficient momentum that it just collides with the front edge.
Q. All right. Filter modifications, that's something that has been implemented or just a description of what could be done?
A. That's been implemented.
Q. All of them?
A. (Nodding head.)
Q. Reconstituted Tobacco, which is 40, no questions.
Air Dilution, no questions.
In 4Q, the Winston 85, Major Design Modifications 1954-1986, Tar Yields and Nicotine Yields. I guess the chart just shows at various times and moments in time what kind of modifications occurred?
A. The major ones.
Q. And then the reason that the line is different is what, that's tracking tar yield?

213

A. The upper one is the tar yield curve; the lower one is nicotine.
Q. Okay. Do you have a chart like that for the Camel Light and Camel Light 100s?

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A. No, I don't. I haven't prepared one.
Q. Have there been very little design modifications in those two brands as opposed to Winston?
A. You have got to realize Winston started much earlier. Camel Light and Camel Light 100s started around 1977, okay, and the design, most of the major design tools were already in place. So there's been a small reduction, I would say, but nothing as dramatic as for Winston because it already started out as a low tar cigarette.
Q. Okay. The Lights came in here on this chart sometime around toward the end of the -- right at the end of the chart, so there just hasn't been very many changes made?
A. Right. It started out as a low tar cigarette, remember.
Q. So it just adopted the changes that had already been made up to that time.
A. Yeah.
Q. Okay. Nanograms per cigarette, we had some discussion about what that means. You have the Camel Light in at 9. Where has it -- compare that to where it was when it started. Or maybe I should ask first -- oh, no, it's on

214

there, the 1999 Camel Light is 100. Where was it in 19 -- the year it came out, whatever year that was?
A. I don't know. I'd have to go back and look.
Q. But it wasn't anywhere near 52, was it?
A. No.
Q. It wasn't significantly higher, was it?
A. Higher than?
Q. 9.Nine?
A. I don't know. We can go back and look.
Q. Okay. This Camel 70: Major Design Modifications, that's just the same idea except instead of Winston it's Camel 70, right?
A. Right.
Q. What is Camel 70? Is that your regular Camel?
A. Camel nonfilter.
Q. Okay. From '62 on, it was essentially the same design from that point on with just paper porosity increase and tar level reduced to some extent?
A. Number of small changes. What that chart shows is for a period of time the tar level, tar yield was pretty much level.
Q. Okay, No. 4T is just a tracking of the tar yields and nicotine yield on sales-weighted average, which we discussed before. The Premiere picture, the cross-section of it, briefly how did it work? You didn't light it?

215

A. You do light it.
Q. You do light it? And how is it different?
A. It was different in that it heated tobacco not burning it.
Q. How did you prevent the burning from happening?
A. Through that different design.
Q. What was lit was insulated away from the tobacco in some way?
A. What is lit is a piece of carbon, purified carbon plug in the front of the cigarette, and that's what burned. Hot gases from the burning carbon traveled down the cigarette and heated the tobacco, the tobacco materials, which then drives off flavors and a little bit of nicotine.
Q. And that's indicated by the "heat source" on this diagram?

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A. The "heat source" refers to the carbon piece.
Q. Okay. What's different about the Eclipse?
A. The design is somewhat different. The aluminum capsule inside the Premier was replaced. There were two types of tobacco in Eclipse. It's similar to Premiere in that it has a burning carbon heat source.
Q. What's the difference that RJR thought would make this one work?
A. Because in Eclipse we're burning a very, very small amount of tobacco to try to improve the taste. It still

216

primarily heats the tobacco, but actually burns a very small and controlled amount of tobacco.
Q. Smoke pH and market share of Winston 85, which is 4Z, what you are just demonstrating on this chart is that as pH went down, your sales stayed about the same or in fact they bounded around, maybe went up. Is that the idea?
A. That's about the idea.
Q. Same for 85, I guess?
A. Similar.
Q. Composition of the 1R4F Total Particulate Matter and compared Premiere Total Particulate Matter. I guess I don't understand what the particulate matter is. I mean I see glycerol, I see "other," I see nicotine. Does this pie represent all of the particulate matter, is that the idea?
A. Uh-huh.
Q. And this is the percentage of it which is those items that are identified?
A. That's correct.
Q. Huge difference in water in Premiere, apparently?
A. Uh-huh.
Q. Where does that come from?
A. Well, it's a result of the design using tobacco heating together with glycerin, which is in that product design. The glycerin carries with it a lot of water.
Q. Then the same thing with regard to the Eclipse?

217

A. Right.
Q. And what are these two, just demonstrate --
A. Demonstrate the major differences in smoke composition between tobacco burning and tobacco heating cigarettes.
Q. Did RJR ever claim that Premiere was safer?
A. No.
Q. Anybody at RJR believe that it was safer?
MR. LATHAM: Object to the form of the question.
BY MR. BROWN: Q. That you know of?
A. Well, I think there was some speculation that it may be, but we certainly haven't had proof that Premiere was safer.
Q. Eclipse - Target Compound Reductions, tell me what that's for or what is it in the first place?
A. That shows reductions compared to reference cigarette for certain compounds in the smoke of Eclipse.
Q. This one doesn't have the reference on there?
A. Right.
Q. Those percentage reductions are compared with a reference cigarette?
A. That's right, a reference tobacco burning cigarette.
Q. What's a vapor phase radical?
A. It's a free radical that is a vapor phase compound.

218

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Q. Why is it called a radical?
A. It's a chemical term. A free radical is a very reactive compound that has a free electron and it's actually that kind of measure of free radicals is actually a gross measure; it's not one specific chemical.
Q. Do all of the items on here carry some risk to a smoker, some health risk?
A. I think those compounds that are on that chart are all compounds that are on the Surgeon General's and some of them are on the IARC list.
Q. Carcinogens?
A. Some are, some are not.
Q. What are the reasons for creating a risk when they're not carcinogens?
A. Because --
MR. LATHAM: Object to the form of question.
THE WITNESS: I'm sorry?
BY MR. BROWN: Q. If they're not carcinogens, what are the reasons to consider them a risk to health?
A. There are constituents in smoke that may be problems even if they're not carcinogens.
Q. Okay. Composition of Camel 70 Non-Filter Mainstream Smoke, and then the same thing with the Light 100. How far back do these two charts, which are 4-II and 4-JJ cover? I guess what point in time do these represent?

A. Let me see. This Camel Light 100 is actually data from like a month and a half ago. This Camel 70, as I recall, is data from about probably two years ago, or something in that neighborhood.
Q. How does the Light 100 mainstream smoke compare to at the time it came out?
A. In a general sense, I think there wouldn't be any significant difference.
Q. At least not from a health standpoint?
MR. LATHAM: Object to the form of the question.
THE WITNESS: You are talking about that pie chart; you didn't ask about health.
BY MR. BROWN: Q. Oh, all right. Let me ask about health. Any health differences between the way it came out and the way it is now in terms of mainstream smoke content?
MR. LATHAM: Object to the form of the question.
THE WITNESS: I don't see any reason to think there would be a difference in the risks of Camel Light 100 when it was first introduced versus today.
BY MR. BROWN: Q. Okay. I don't know why Premiere is down here. I thought that was marked No. 1. Is there something else? Oh, it's different. This is compound reduction.
Okay. Okay, we're through it. Is there any area of your opinion that you believe we have not touched on that

you understand you are going to present by the RJR lawyers?
A. I can't think of any as I sit here.
MR. BROWN: Okay, I am through. That's it.
MR. LATHAM: No questions.
(Whereupon, deposition concluded at 8:10 p.m.)

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